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VOL. 32 ULY, 1940 NO. 7

M RSHIP LIST

MITTEES

CONST ON AND BY-LAWS

AMERIC WORKS ASSOCIATION
, New York, N.Y.

SUPPLEMENT TO

JOURNAL

OF THE

AMERICAN WATER WORKS ASSOCIATION

VOL. 32 JULY, 1940 NO. 7

MEMBERSHIP LIST

COMMITTEES

CONSTITUTION AND BY-LAWS

AMERICAN WATER WORKS ASSOCIATION
22 E. 40th St., New York, N. Y.

Made in United States of America

USE OF THE MEMBERSHIP LIST

The membership list published herein is intended for use in connection with the activities of the Association. Its use for circularization purposes not directly connected with those activities is not approved. Members are requested to assist the officers in discouraging the use of this list for any unauthorized purposes.

An application blank for use in bringing a new member into the Association is bound in the back of this book for your convenience.

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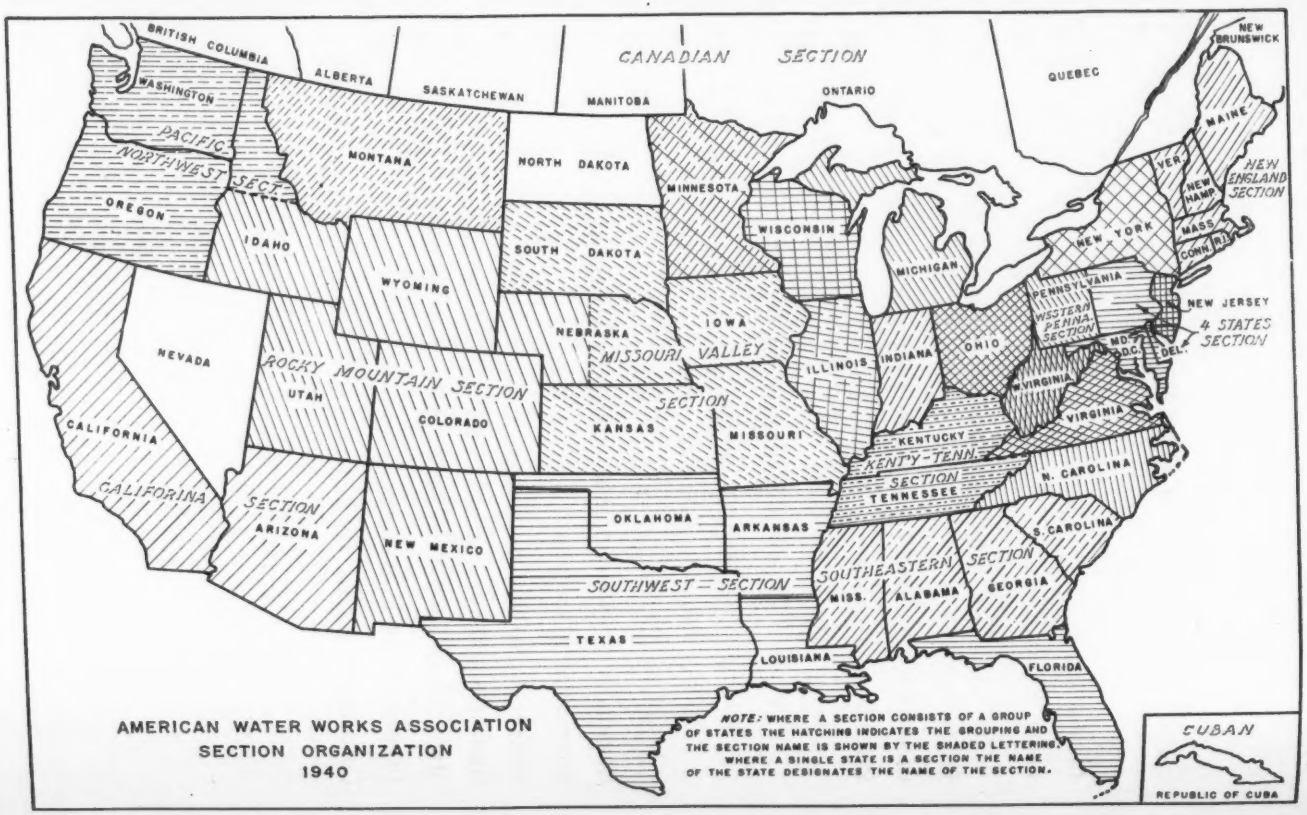
BRITISH COLUMBIA
ALBERTA
SASKATCHEWAN
MANITOBA
CANADIAN SECTION
ONTARIO
QUEBEC
NEW BRUNSWICK
WASHINGTON
PACIFIC NORTHWEST SECT.
OREGON
MONTANA
NORTH DAKOTA
MINNESOTA
MAINE
VER.
NEW HAMP.
MASS.
CONN.
R.I.
NEW ENGLAND SECTION
IDAHO
WYOMING
SOUTH DAKOTA
WISCONSIN
MICHIGAN
NEW YORK
PENNSYLVANIA
WESTERN PENNA. SECTION
NEW JERSEY
4 STATES SECTION
MD.
D.C.
DEL.
NEVADA
UTAH
COLORADO
NEBRASKA
IOWA
MISSOURI VALLEY SECTION
ILLINOIS
INDIANA
OHIO
W. VIRGINIA
VIRGINIA
ROCKY MOUNTAIN SECTION
CALIFORNIA
KANSAS
MISSOURI
KENTUCKY
KENT'Y-TENN. SECTION
TENNESSEE
N. CAROLINA
CALIFORNIA SECTION
ARIZONA
NEW MEXICO
OKLAHOMA
ARKANSAS
S. CAROLINA
SOUTHEASTERN SECTION
SOUTHWEST SECTION
MISS.
ALABAMA
GEORGIA
TEXAS
LOUISIANA
FLORIDA
CUBAN
REPUBLIC OF CUBA
AMERICAN WATER WORKS ASSOCIATION
SECTION ORGANIZATION
1940
NOTE: WHERE A SECTION CONSISTS OF A GROUP OF STATES THE HATCHING INDICATES THE GROUPING AND THE SECTION NAME IS SHOWN BY THE SHADED LETTERING. WHERE A SINGLE STATE IS A SECTION THE NAME OF THE STATE DESIGNATES THE NAME OF THE SECTION.

INTRODUCTION

THE American Water Works Association was organized in 1881 to "advance the knowledge of the design, construction, operation and management of water works." Its activities in part are developed through regional or state Sections, in part through general Divisions, in part through technical committees and in part through its monthly JOURNAL.

There are at present 25 regional or state Sections. The largest ones are in California and New York. Each Section has at least one meeting each year with attendance totals ranging from 100 to more than 1,000 persons interested in the field. Papers are presented; round table discussions are held; tests are made; exhibits frequently are available—all designed to improve water works design and management in the Section area.

There are three professional Divisions of the Association: Plant Management and Operation, Water Purification, and Finance and Accounting. The programs at the annual convention of the Association are built around the activities of these Divisions.

The technical work of the Association is organized under the Committee on Water Works Practice. This is a group of eleven men, selected so as to provide a cross section of the Association's field of interest, in the persons of leaders in the field. No technical pronouncements in the name of the Association are made until they are accepted by this committee and approved by the Board of Directors. Recent products of technical activities within the Association are: Standard Specifications for Steel Pipe and Protective Coatings, Standard Specifications for Elevated Tanks, Standard Specifications for Gate Valves, for Hydrants, for Laying Cast Iron Pipe and Methods of Testing Activated Carbon. Under ASA procedure the Association has cooperated in the preparation of the new Specifications for Pit Cast Cast Iron Pipe. *Standard Methods of Water Analysis* is a joint publication of the American Public Health Association and the American Water Works Association, now in its eighth edition. *A Manual of Water Works Accounting*, issued for the first time in 1938, is a joint enterprise of the Municipal Finance Officers Association and the American Water Works Association. The

Association has recently issued a *Manual of Water Quality and Treatment* which covers all phases of water purification.

The JOURNAL of the A.W.W.A. is a monthly publication which totals 2,100 pages per year. In it are found the papers and reports on water works subjects deemed to have permanent or major value to the field. About 300 pages annually are given over to abstracts of articles the world over which relate to all phases of water works affairs. No comparable cross section of data exists elsewhere. An Index of Association publications for the years 1881 to 1939 is available.

Many of the Association's Sections hold each year one or more water works schools (conferences or in-service training institutes) and several cooperate in the procedure within their states which licenses the operators of water treatment plants. This is done in order to insure to the various communities as permanent and well-trained personnel as can be provided.

The Association maintains headquarters at 22 East 40th Street, New York, N. Y., with a full time staff of seven persons available for conference or correspondence upon matters of general water works interest. On January 1, 1940 there were 3,710 paid members, including 3,119 Active, 294 Corporate (city boards, etc.), 200 Associate (manufacturers), 24 Honorary, 14 Junior and 59 Affiliates. The Association has had a more than 33 per cent increase in membership during the past three years.

LOCAL SECTIONS

There have been established twenty-five Local Sections, under the provisions of Article VII of the Association's By-Laws. Each of these Sections consists of the Association members who reside in the territory embraced by that Section. These Sections with the territory and the number of members in each are enumerated in this book on page 184, following the geographic list of members.

Each Local Section has its own officers, as listed each month in the front of the JOURNAL of the American Water Works Association. These officers are all selected by the Section itself under the provisions of the By-Laws of that Section. One of these officers is a member selected to represent his Section on the Board of Directors of the American Water Works Association, in accordance with Articles III and IV of the Association's Constitution.

The Local Sections each hold one or more meetings during the year, their practice in this respect, as well as the conduct of all of their business, being adapted to meet best the needs of their respective territories. Papers presented at the Local Section meetings are drawn upon for publication in the JOURNAL of the Association, the

same as papers presented at the Annual Convention of the Association.

Each member and affiliate of the American Water Works Association is automatically a member of the Section in whose territory he resides, and there are no membership dues other than the regular Association dues, each Section receiving its funds from the Association.

NATIONAL DIVISIONS

In accordance with the provisions of Article VII of the Association's By-Laws, the Board of Directors has established three National Divisions consisting of groups of the members who are particularly interested in certain branches of the water supply industry.

The Water Purification Division: This Division was organized originally as the Chemical and Bacteriological Section in 1913. The present name was adopted in 1925. The objects of this Division in particular are: the advancement of the science and art of water purification; the stimulation of research in the physical, chemical and bacteriological fields as related to the causes and effects of pollution and to methods of purification; and the promotion of progress in the design, construction and operation of water purification works.

The Plant Management and Operation Division: This Division was established in 1924. The objects of this Division, as stated in its By-Laws, are the same as those of the Association, namely, the advancement of knowledge of the design, construction, operation and management of water works and the encouragement, by social intercourse among its members, of a friendly exchange of information and experience.

The Finance and Accounting Division: This Division was established in 1929. Its objects are stated to be the same as those of the Association, and are particularly related to the accounting and financial operations incident to the operation of water works.

Any Active or Junior Member or Affiliate of the American Water Works Association may become a member of any one or more of these Divisions upon request, and with no further dues. The principal activities of the Divisions take place during the Annual Convention of the Association, at which time a number of the technical sessions are held under the auspices of the Divisions. Each of such meetings is presided over by the officers of the Division concerned and the subjects of discussion are those in which that Division is interested. The Divisions may also appoint committees for study, research and report upon subjects of interest to them. These committees act under the general supervision of the Association's standing Committee on Water Works Practice.

PUBLICATIONS

(1) The JOURNAL of the American Water Works Association is a monthly publication which is sent to each member. It contains papers, discussions and committee reports presented at the Annual Conventions of the Association and at the meetings of its Local Sections. Also included are the accounts of the business proceedings at the conventions and meetings, news notes of particular interest to members, and an exceptionally complete section consisting of abstracts of current water works literature. An index is available covering all issues of the JOURNAL, and of its predecessor the Proceedings, 1881 to 1939.

(2) *The Manual of Water Quality and Treatment* was published in 1940. Its 294 pages include useful information on all phases of purification of municipal water supplies. It was developed in a series of chapter monographs by groups of A.W.W.A. members who were specialists in the subject matter assigned to them.

(3) *The Manual of Water Works Accounting* was published in 1938. It is a joint enterprise of the Municipal Finance Officers Association and the American Water Works Association, prepared by a staff of accountants and reviewed by a large group of water works men engaged in accounting. It is an indispensable reference text for the accountant in the water works field.

(4) *Standard Methods for the Examination of Water and Sewage* is a joint publication of the American Water Works Association and the American Public Health Association. It is now in its eighth edition and stands preëminent in the field of sanitary laboratory work.

(5) *The Manual of Water Works Practice* is a book which was published by the Association in 1925. In its 800 pages are discussed collection, distribution, treatment and consumption of water supplies.

(6) Other publications by the Association consist of many separately printed standard specifications, committee reports and such articles from the JOURNAL as may have been issued in separate reprint form.

Reference is made to current specifications in the listing of the Association's Water Works Practice Committee which developed them.

CONVENTIONS AND PAST PRESIDENTS

The President's term of office ends on the last day of the convention.

1	St. Louis, Mo.	March 29–31, 1881	*John T. Foster
2	Columbus, Ohio	March 14–16, 1882	*John T. Foster
3	Buffalo, N. Y.	May 15–17, 1883	*John T. Foster
4	Cincinnati, Ohio	April 15–17, 1884	*John G. Briggs
5	Boston, Mass.	April 21–23, 1885	*L. H. Gardner
6	Denver, Colo.	June 23–25, 1886	*Peter Milne, Jr
7	Minneapolis, Minn.	July 13–15, 1887	*B. F. Jones
8	Cleveland, Ohio	April 17–19, 1888	*J. T. Fanning
9	Louisville, Ky.	April 16–18, 1889	*A. N. Denman
10	Chicago, Ill.	May 20–24, 1890	*John H. Decker
11	Philadelphia, Penna.	May 14–17, 1891	*William Benedict Bull
12	New York, N. Y.	May 17–19, 1892	*John M. Diven
13	Milwaukee, Wis.	Sept. 5–9, 1893	*G. H. Benzenberg
14	Minneapolis, Minn.	Aug. 21–23, 1894	*James Peter Donahue
15	Atlanta, Ga.	May 28–30, 1895	*William Ryle
16	Indianapolis, Ind.	May 26–28, 1896	*William G. Richards
17	Denver, Colo.	June 8–10, 1897	*F. A. W. Davis
18	Buffalo, N. Y.	June 14–18, 1898	*John Caulfield
19	Columbus, Ohio	May 16–19, 1899	*Joseph A. Bond
20	Richmond, Va.	May 15–18, 1900	*R. M. Clayton
21	New York, N. Y.	June 17–22, 1901	*Charles E. Bolling
22	Chicago, Ill.	June 10–13, 1902	*William R. Hill
23	Detroit, Mich.	June 23–26, 1903	*Charles H. Campbell
24	St. Louis, Mo.	June 6–11, 1904	*L. N. Case
25	West Baden, Ind.	May 9–12, 1905	*Morris R. Sherrerd
26	Boston, Mass.	June 26–30, 1906	*Benjamin C. Adkins
27	Toronto, Ont.	June 17–21, 1907	*Dabney H. Maury
28	Washington, D. C.	May 11–16, 1908	*George H. Felix
29	Milwaukee, Wis.	June 7–12, 1909	*D. W. French
30	New Orleans, La.	April 25–29, 1910	*William Pitt Mason
31	Rochester, N. Y.	June 5–10, 1911	John Watson Alvord
32	Louisville, Ky.	June 3–7, 1912	*Alexander Milne
33	Minneapolis, Minn.	June 23–27, 1913	*Dow R. Gwinn
34	Philadelphia, Penna.	May 11–15, 1914	*Robert J. Thomas
35	Cincinnati, Ohio	May 10–14, 1915	George Goodell Earl
36	New York, N. Y.	June 5–9, 1916	*Nicholas Snowden Hill, Jr.
37	Richmond, Va.	May 7–11, 1917	*Leonard Metcalf
38	St. Louis, Mo.	May 13–17, 1918	Theodore A. Leisen
39	Buffalo, N. Y.	June 9–13, 1919	Charles R. Henderson

*Deceased.

40	MONTREAL, QUE.....June	21–25, 1920	CARLETON E. DAVIS
41	CLEVELAND, OHIO.....June	6–10, 1921	BEEKMAN C. LITTLE
42	PHILADELPHIA, PENNA...May	15–19, 1922	EDWARD BARTOW
43	DETROIT, MICH.....June	21–25, 1923	*WILLARD S. CRAMER
44	NEW YORK, N. Y.....May	19–23, 1924	*GEORGE W. FULLER
45	LOUISVILLE, KY.....Apr. 27–	May 1, 1925	FRANK C. JORDAN
46	BUFFALO, N. Y.....June	7–11, 1926	*HARRY F. HUY
47	CHICAGO, ILL.....June	6–11, 1927	*ALLAN W. CUDDEBACK
48	SAN FRANCISCO, CALIF..June	11–15, 1928	JAMES E. GIBSON
49	TORONTO, ONT.....June	24–28, 1929	WILLIAM W. BRUSH
50	ST. LOUIS, MO.....June	2–6, 1930	JACK J. HINMAN, JR.
51	PITTSBURGH, PENNA.....May	25–29, 1931	GEORGE H. FENKELL
52	MEMPHIS, TENN.....May	2–6, 1932	ROSS L. DOBBIN
53	CHICAGO, ILL.....June	12–16, 1933	GEORGE W. PRACY
54	NEW YORK, N. Y.....June	4–8, 1934	MALCOLM PIRNIE
55	CINCINNATI, OHIO.....May	6–10, 1935	HARRY E. JORDAN
56	LOS ANGELES, CALIF....June	8–12, 1936	FRANK A. BARBOUR
57	BUFFALO, N.Y.....June	7–11, 1937	WILLIAM W. HURLBUT
58	NEW ORLEANS, LA.....April	24–28, 1938	EUGENE F. DUGGER
59	ATLANTIC CITY, N. J....June	11–15, 1939	REEVES NEWSOM
60	KANSAS CITY, MO.....April	21–25, 1940	J. ARTHUR JENSEN

*Deceased

HONORARY AWARDS

The members listed below are also included in the Consolidated List of Members

HONORARY MEMBERSHIP

Honorary Membership in the American Water Works Association is provided for in the By-Laws of the Association, Article I, Sections 1 and 2. The method of the election of Honorary Members is stated in the By-Laws, Article II, Section 1. The presentation of Honorary Memberships usually takes place during the Annual Convention of the Association. The present Honorary Members of the Association, with the year of their election to such membership, are as follows:

John Watson Alvord	1930
Moses Nelson Baker	1936
Frank Alexander Barbour	1939
Edward Bartow	1936
Thomas Brooks	1937
William Whitlock Brush	1937
Carleton Emerson Davis	1939
Ross Leonard Dobbin	1937
George Goodell Earl	1926
George Harrison Fenkell	1940
James Edwin Gibson	1940
Charles Robert Henderson	1936
Charles Gilman Hyde	1939
Harry Edward Jordan	1939
John Aspin Kienle	1940
Ralph Waldo Lawton	1938
Theodore Alfred Leisen	1938
Beekman Cox Little	1939
Herbert Merrill Lofton	1940
Daniel Webster Mead	1930
Denis Francis O'Brien	1935
William John Orchard	1937
William Marshall Rapp	1937
Arthur Newell Talbot	1930
James Lawrence Tighe	1926
Edward Everett Wall	1936
Robert Spurr Weston	1930

THE JOHN M. DIVEN MEMORIAL MEDAL

The John M. Diven medal was established by the Association in 1925 in memory of John M. Diven, a water works superintendent of many years experience and who served as the Association's President

in 1892, Vice President 1887–89, Treasurer 1890–91, 1903–13, Secretary 1890–91, 1903–23, and Editor 1914–16.

The award is made each year to the member who has rendered the most outstanding service to the Association during the year, as determined by a committee appointed for the purpose and whose report is subject to ratification by the Board of Directors. The medal is a bronze plaque bearing the likeness of Mr. Diven.

George Warren Fuller	1926
Arthur Ellsworth Gorman	1927
Willard Samuel Cramer	1928
James Edwin Gibson	1929
Ross Leonard Dobbin	1930
Malcolm Pirnie	1931
William Whitlock Brush	1932
Samuel Brooks Morris	1933
Leonard Percy Wood	1934
Linn Harrison Enslow	1935
Harry Edward Jordan	1936
Abel Wolman	1937
William Curtis Mabee	1938
Hallett Francis Smith	1939
William Victor Weir	1940

THE JOHN M. GOODELL PRIZE

The John M. Goodell prize was established in 1931 under the terms of an endowment by *Engineering News-Record* and as a memorial to John M. Goodell, a former editor of *Engineering News-Record* and the editor of the Journal of the American Water Works Association, 1917–21.

The prize is awarded annually to the member who has made the most notable contribution to the science or practice of water works development, usually as recorded in the form of a paper published in the Association's Journal. The selection is made by a committee appointed for that purpose and whose report is subject to ratification by the Board of Directors. The prize consists of an engraved certificate and the cash resulting from that year's income of the endowment, usually at least fifty dollars.

John Robert Baylis		1932
Charles Herbert Spaulding		1933
Willard Townshend Chevalier		1934
Frank Eugene Hale		1935
Mathew Michael Braidech		1936
Laurance Edward Goit Harry Hayes	Jointly	1937
Vance Christopher Lischer		1938
Albert George Fiedler David Grosh Thompson	Jointly	1939
Melvin Lorenius Enger Thomas Hollis Wiggin	Jointly	1940

THE NICHOLAS S. HILL, JR., CUP

The Nicholas S. Hill, Jr., cup is an award which was established by Past President Nicholas S. Hill, Jr., during his term of office in 1915–16. It is awarded at each Annual Convention to that Local Section of the Association which has made the largest percentage gain in membership during the year.

Under the original terms of the award the cup was to become the permanent possession of the Section which first won it for three successive years. This was first accomplished by the Minnesota Section, but due to the unusual conditions then prevailing as a result of the war the Section returned the cup for continued competition. When the North Carolina Section won the cup for the third successive year in 1924 the Section returned it to the Association with the stipulation that no Section should again win it permanently. The names of the winning Sections are engraved upon the cup.

Canadian Section	1916
Minnesota Section	1917–'18–'19
Canadian Section	1920
Central States Section	1921
North Carolina Section	1922–'23–'24
California Section	1925–'26
Florida Section	1927–'28
Pacific Northwest Section	1929
Southeastern Section	1930
Pacific Northwest Section	1931
California Section	1932
Montana Section	1933
Canadian Section	1934
Virginia Section	1935
Rocky Mountain Section	1936
Indiana Section	1937
Michigan Section	1938
West Virginia Section	1939
Southwest Section	1940

THE FRANKLIN HENSHAW CUP

The award of the Franklin Henshaw Cup was established in 1934 as the result of a gift to the Association by Mr. Franklin Henshaw. At each Annual Convention this cup is awarded, for one year, to that Local Section which has held the best attended meeting during the year past. The attendance figure is computed by a formula which gives weight both to the proportion of the Section members present and to the number of guests at the meeting.

Montana Section	1935
Montana Section	1936
Indiana Section	1937
Pacific Northwest Section	1938
North Carolina Section	1939
Wisconsin Section	1940

SUMMARY OF MEMBERSHIP, JULY 1, 1940

Honorary Members	27
Active Members	3,283
Corporate Members	311
Associate Members	205
Junior Members	21
Affiliates	79
Total	3,926

The Consolidated List of Members, which begins on the page opposite, includes the members of all grades—Honorary, Active, Corporate, Associate and Junior—and also the Affiliates. The listing is correct as of July 1, 1940, including all those whose applications were received up to that date.

For separate listings of:

Honorary Members, see page 11;
Corporate Members, see page 150;
Associate Members, see page 153.

All members are listed geographically beginning on page 155.

The date when the member first joined the Association is cited in each listing. Active Members are designated only by the date, for example, (July '39). Corporate, Associate and Junior Members and Affiliates are shown in the following manner: (Corp. M. July '39), (Assoc. M. July '39), (Jr. M. July '39) and (Affil. July '39).

Offices held by members are cited according to the years of the conventions during which the members served. Awards and Honorary Memberships are shown by the year of the convention at which they were presented.

Members frequently fail to inform the Association headquarters of changes in titles and addresses. The Association will appreciate receiving corrections of any such items included in this Membership List.

CONSOLIDATED LIST OF MEMBERS

Abbott, Carroll B., Pres., Water Works Supply Co., 501 Howard St., San Francisco, Calif. (May '22)

Abbott, G. H., Treas. & Supt., Southbridge Water Supply Co., Southbridge, Mass. (May '12)

Abbs, John, Foreman in Charge of Meter Shop, Rochester Water Works, Dewey Ave. & Bloss St., Rochester, N. Y. (July '35)

Abell D. S., Prin. Asst. Engr., State Board of Health, Raleigh, N. C. (Nov. '32)

Abercrombie, J. S., Co., Fred W. Karl, Sweeny, Tex. (Corp. M. Jan. '40)

Ables, A. D., Supt., Water Works, Box 33, Hollis, Okla. (Oct. '39)

Abner Hood Chemical Co., Roy A. Parker, Salesman, 507-517 N. Montgall Ave., Kansas City, Mo. (Assoc. M. Jan. '40)

Abplanalp, C. C., Wallace & Tiernan Co., Inc., 809 W. Washington Blvd., Chicago, Ill. (Mar. '31)

Abraham, Chas. P., Supt., Bureau of Water, Municipal Bldg., Lancaster, Pa. (May '30)

Abrams, M. F., Wailes Dove-Hermiston Corp., 17 Battery Place, New York, N. Y. (Oct. '37)

Abrams, Norman H., Repr., Badger Meter Co., Waco, Tex. (Oct. '39)

Ackerman, J. Walter, Munnsville, Madison County, N. Y. (Feb. '10) *Trustee '30. Director '31-'32.*

Acres, H. G., Pres., H. G. Acres & Co., Cons. Engrs., Main & Ferry Sts., Niagara Falls, Ont., Can. (June '27)

Activated Alum Corp., Fred E. Stuart, Pennington Ave. at Aspen St., Curtis Bay, Baltimore, Md. (Assoc. M. Jan. '37)

Adams, Alton D., Cons. Engr., 15 Abbott St., Wellesley, Mass. (Sept. '12)

Adams, Arthur J., *see* Auburn Water Dept.

Adams, Clarence D., Water Plants Supt., Public Service Co. of Indiana, P. O. Box 307, New Albany, Ind. (Jan. '35)

Adams, F. P., Mgr., Water Works, Brantford, Ont., Can. (Dec. '30)

Adams, G. P., Filter Plant Operator, Napoleon Water Works, 1003 Scott St., Napoleon, Ohio (Apr. '39)

Adams, Howard J., Supt., Northern Illinois Water Corp., 120 N. Park St., Streator, Ill. (Jan. '38)

Adams, John M., Town Engr., Hammonton, N. J. (Jan. '36)

Adams, John M., Engr., Pendleton Water Com., 107 S. E. 6th St., Pendleton, Ore. (Apr. '40)

Adams, Reginald B., Chemist & Bacteriologist, Pennsylvania Water Co., 712 South Ave., Wilkinsburg, Pa. (June '30)

Adams, Robert Wynn, Hydr. & San. Engr., Civ. Eng. Dept., Mississippi State College, State College, Miss. (Oct. '38)

Adams, W. K., Supt., Water Dept., Box 469, Redding, Calif. (Oct. '39)

Adams, Walter F., City Engr., Santa Rosa, Calif. (Oct. '39)

Addressograph-Multigraph Corp., G. L. Harris, Mgr. of Methods Dept., Euclid Post Office, Cleveland, Ohio (Assoc. M. Jan. '35)

Adirondack Water Works, H. N. Haberer, Lowville, N. Y. (Corp. M. Jan. '23)

Adkins, W. W., Supt. of Plants, Water Dept., City Hall, Asheboro, N. C. (July '40)

Aeryns, Albert N., 716 Greenwood Ave., Brooklyn, N. Y. (Jan. '15)

Aga, A. K., Engr., Jharia Water Board, Engineer's Bungalow, Dhaya, P. O. Dhanbad, Manbhum, India (Jan. '35)

Ahrens, H. C., *see* Winona Board of Munic. Works

Aicher, Rolland V., Supt., Huron Water Works, Huron, Ohio (July '39)

Alarcon, Domingo Guevara, Chief Engr. of Junta Federal de Mejoras Materiales de Veracruz, Edificio Aduana Maritima, Veracruz, Ver., Mexico (Jan. '38)

Albert, J. E., Vice-Pres., Associated Public Utilities Corp., 17 N. High St., Columbus, Ohio (Feb. '29)

Albrecht, Robert H., Supt. of Public Works, Board of Water, Light & Sewer Com., Hamilton, N. Y., (Affil. Jan. '39)

Albright, Porter, South Elsinore Mutual Water Co., Elsinore, Calif. (Oct. '38)

Alderman, Frank E., City Engr., City Hall, South Gate, Calif. (Oct. '39)

Aldrich, Ellwood H., 7716 Austin St., Forest Hills, N. Y. (July '35)

Ale, H. S., Supt., Bureau of Water, City Hall, Altoona, Pa. (Mar. '33)

Alexander, Carl, City Water Works, Rome, Ga. (Mar. '33)

Alexander, Louis J., Southern California Water Co., 950 Bendix Bldg., 12th & Maple Sts., Los Angeles, Calif. (Oct. '37)

Alexander, R. C., Mgr., Water Co., Centerville, Iowa (July '20)

Alfke, Charles J., Mgr., Hackensack Water Co., 624 Park Ave., Weehawken, N. J. (Mar. '25)

Allan, Lawrence F., City Hall, Room 320, Toronto, Ont., Can. (June '29)

Allen, A. J., Research Engr., Rheem Mfg. Co., Richmond, Calif. (Jan. '40)

Allen, Bernard, Mgr., Blytheville Water Co., Blytheville, Ark. (Apr. '37)

Allen, Henry A., Cons. Engr., 3138 Sheridan Rd., Chicago, Ill. (Jan. '27)

Allen, Hoyt E., Supt., Municipal Service, Wyandotte, Mich. (July '29)

Allen, Lloyd, Jr., Surveyor & Draftsman, 501 N. Lucerne Blvd., Los Angeles, Calif. (Apr. '38)

Allen, Victor H., Editorial Asst., American Water Works Assn., 22 East 40th St., New York, N. Y. (Jan. '39)

Allendale, Water Dept. of Boro of, Lyman Ceely, Chairman of Water Com., Allendale, N. J. (Corp. M. Oct. '38)

Allentown Bureau of Water, Wm. R. Schnabel, Supt. & Engr., City Hall, Allentown, Pa. (Corp. M. May '22)

Allgeyer, John, Supt., Filter Plant, Water Div., 34 E. Grand Blvd., St. Louis, Mo. (July '27)

Allis-Chalmers Mfg. Co., W. M. White, Mgr. & Chief Engr., Hydr. Dept., Milwaukee, Wis. (Assoc. M. June '05)

Allport, Roy G., Chairman, Smiths Falls Water Com., Smiths Falls, Ont., Can. (Jan. '40)

Alpers, Frank H., Supt., Water Company, Cimarron, N. M. (Oct. '19)

Altoberro, Juan Carlos, Ing., 2029 Charrua St., Montevideo, Uruguay, S. A. (May '28)

Alvord, John W., Alvord, Burdick & Howson, Engrs., 20 N. Wacker Drive, Chicago, Ill. (Apr. '99) *Vice-Pres. '09, '10. President '11. Exec. Com. '12. Honorary M. '30.*

Amend, J. E., 61 S. 6th St., Brighton, Colo. (July '35)

American Brass Co., F. G. Smith, 414 Meadow St., Waterbury, Conn. (Assoc. M. Aug. '22)

American Cast Iron Pipe Co., Lester Long, P. O. Box 2603, Birmingham, Ala. (Assoc. M. July '07)

"American City, The," Edgar J. Buttenheim, 470 Fourth Ave., New York, N. Y. (Assoc. M. May '18)

American Colloid Co., Paul Bechtner, Pres., 363 W. Superior St., Chicago, Ill. (Assoc. M. Apr. '38)

American Concrete Pipe Assn., M. W. Loving, 33 W. Grand Ave., Chicago, Ill. (Assoc. M. Oct. '17)

American Cyanamid & Chemical Corp., J. D. Lowery, 30 Rockefeller Plaza, New York, N. Y. (Assoc. M. June '06)

American Foundry & Mfg. Co., 1015 Hebert St., St. Louis, Mo. (Assoc. M. May '08)

American Pipe & Steel Corp., Jack Lane, 230 Date Ave., Alhambra, Calif. (Assoc. M. Oct. '38)

American Rolling Mill Co., R. C. Beam, Culvert & Pipe Sales Div., Middletown, Ohio (Assoc. M. Jan. '27)

American Water Softener Co., G. S. Garrett, Treas., Lehigh Ave. & Fourth St., Philadelphia, Pa. (Assoc. M. July '23)

American Water Works & Elec. Co., Inc., H. Hobart Porter, Pres., 50 Broad St., New York, N. Y. (Corp. M. June '15)

Ames, J. H., *see* Ames Water Dept.

Ames Water Dept., J. H. Ames, City Mgr., Ames, Iowa (Corp. M. Jan. '37)

Amiss, Thomas L., Supt., Water & Sewerage, Shreveport, La. (May '18)

Amrine, W. F., Gen. Mgr., London Water Works Co., 13 E. First St., London, Ohio (Jan. '39)

Amsbary, Frank C., Jr., Supt., Illinois Water Service Co., Champaign, Ill. (Jan. '27) *Director '40-42.*

Anaconda Copper Mining Co., Water Works Dept., H. M. Johnson, P. O. Box 548, Anaconda, Mont. (Corp. M. June '10)

Anderson, A. E., *see* Moline Water Works

Anderson, A. L., Sr. Civ. Engr., Chief, San. & Hydr. Section, Construction Service, War Dept., Falls Church, Va. (Nov. '25)

Anderson, City of, Paul C. Laux, City Chemist, Anderson, Ind. (Corp. M. Jan. '35)

Anderson, Clarence S., Supt. of Public Works, Munic. of Township of Tisdale, South Porcupine, Ont., Can. (Apr. '38)

Anderson, E. D., *see* Northern Indiana Public Service Co.

Anderson, Frank D., Gen. Meter Foreman, 3148 S. Sacramento Ave., Chicago, Ill. (Apr. '38)

Anderson, H. E., Chief Clerk, City Water Dept., Muskogee, Okla. (Oct. '39)

Anderson, Milton, 854 Water & Power Bldg., Box 3669 Terminal Annex, Los Angeles, Calif. (Oct. '34)

Anderson, S. T., 547 S. Park Ave., Springfield, Ill. (July '35)

Anderton, Earl F., Chem. Engr., Brunswick Pulp & Paper Co., Brunswick, Ga. (Jan. '39)

Andrews, A. I., Sales Engr., Wallace & Tiernan Co., Box 178, Newark, N. J. (Oct. '37)

Andrews, John, Asst. Engr., Div. of San. Eng., State Board of Health, Raleigh, N. C. (Oct. '39)

Andrews, Robert E., National Board Fire Underwriters, 1014 Merchants Exchange Bldg., San Francisco, Calif. (June '13)

Angle, C. F., Supt. of Water Purif., Tubize Chatillon Corp., Rome, Ga. (Jan. '38)

Angus, Robert W., Prof. of Mech. Eng., University of Toronto, Toronto, Ont., Can. (Feb. '17)

Anheuser-Busch, Inc., G. W. Frieberg, Chief Bacteriologist, 721 Pestalozzi St., St. Louis, Mo. (Corp. M. Apr. '38)

Ankener, Richard, Asst. Engr., Dept. of Water Supply, Gas & Elec., 32 53 42nd St., Long Island City, N. Y. (Oct. '22)

Ann Arbor Water Dept., H. H. Caswell, City Hall, Ann Arbor, Mich. (Corp. M. Apr. '19)

Anthony, Sidney S., Augusta Water Dist., Augusta, Me. (Apr. '36)

Antweiler, John J., Engr. of Distr., Cleveland Div. of Water, 90 Empire Ave., Cleveland, Ohio (June '27)

Apgar, Paul N., Supt. Mains & Services, Water Dept., City Hall, East Orange, N. J. (Affil. Oct. '38)

Applebaum, Samuel B., San. Engr., 330 W. 42nd St., New York, N. Y. (Apr. '16)

Applegate, George, Power House Foreman, Refinery Div., Sun Oil Co., P. O. Box 920, Woodville St., Toledo, Ohio (Oct. '39)

Archer, Elmer T., Cons. Engr., New England Bldg., Kansas City, Mo. (May '18)

Archibald, J. G., Supt., Water Works System, Woodstock, Ont., Can. (Feb. '21)

Arenander, Carl A., 587 Summer Ave., Newark, N. J. (Oct. '35)

Argentina, Obras Sanitarias de la Nacion, Biblioteca, Don Ludovico Ivanissevich, Charcas 1840, Buenos Aires, Argentina (Corp. M. Jan. '26)

Armstrong, C. G. R., Cons. Engr., Bartlet Bldg., Suite 605-6, Windsor, Ont., Can. (May '34)

Armstrong, James W., 2722 Second Ave., Bradenton, Fla. (Mar. '10) *Fuller Award '39.*

Armstrong, Kenneth C., Supt. of Water Works, Empresas Publicas Municipales, Barranquilla, Colombia, S. A. (Dec. '24)

Armstrong, Roger W., 136 Hicks St., Brooklyn, N. Y. (Apr. '16)

Arnold, Gerald E., Chief Water Purif. Engr., San Francisco Water Dept., Millbrae, Calif. (Sept. '33) *Fuller Award '39.*

Arnold, L. E., Pres. & Mgr., Water Works Equipment Co., 151 W. Second South St., Salt Lake City, Utah (Oct. '39)

Arnold, William L., Auditor, California Water & Telephone Co., 2130 Huntington Drive, San Marino, Calif. (July '33)

Art Concrete Works, Frank M. Brooks, P. O. Box 417, Pasadena, Calif. (Assoc. M. Dec. '20)

Ashby, R. K., Supt., City Water Dept., Richardson, Tex. (Oct. '39)

Ashford, F. J., City Clerk, Box 1040, Swift Current, Sask. Can. (Jan. '37)

Ashland Water Dept., Ashland, Ore. (Corp. M. Apr. '40)

Ashline, Robert R., Electrolysis Engr., Bureau of Water Works & Supply, 510 E. 2nd St., Los Angeles, Calif. (Oct. '35)

Atkinson, Asher, Engr., Water Dept., 49 Mine St., New Brunswick, N. J. (Mar. '22)

Atkinson, George E., City Engr., Havre, Mont. (Jan. '35)

Atlas Mineral Products Co. of Pa., Geo. L. Wirtz, Mertztown, Pa. (Assoc. M. May '26)

Atlas Powder Co., John Swenehart, Adv. Mgr., Delaware Trust Bldg., Wilmington, Del. (Assoc. M. Jan. '37)

Attersall, Charles F., Supt., Water Works, Winchester, Ky. (June '10)

Auburn Water Dept., Arthur J. Adams, Memorial City Hall, Auburn, N. Y. (Corp. M. Mar. '11)

Aultman, William W., Engr., Metropolitan Water Dist. of Southern California, 306 W. Third St., Los Angeles, Calif. (Jan. '36)

Aurora Water & Light Com., Charles Juhlin, Supt., Aurora, Minn. (Corp. M. Jan. '40)

Austin Board of Water, Elec. Gas & Power Com., W. T. Meseck, Supt., 419 E. Water St., Austin, Minn. (Corp. M. July '35)

Austin, Ralph D., City Engr., Supt., Water, City Hall, Little Falls, N. Y. (Apr. '38)

Avrett, W. L., Jr., 886 Wildwood Rd., N.E., Atlanta, Ga. (Apr. '36)

Axelrad, B. A., Tech. Asst. to Gen. Supt., Freeport Sulphur Co., Freeport, Tex. (Apr. '39)

Ayars, William F., *see* Salem Water Dept.

Ayers, Edward, *see* Montgomery Board of Water Comrs.

Ayliffe, Ora C., Supt. of Filtration, 1429—7th St., S., Fargo, N. D. (July '37)

Ayres, Louis E., Civ. Engr., Ayres, Lewis, Norris & May, 506 Wolverine Bldg., Ann Arbor, Mich. (Nov. '16)

Baals, Harry W., Mayor, City Hall, Fort Wayne, Ind. (Jan. '35)

Babbitt, Harold E., Prof. of San. Eng., Univ. of Illinois, 204 Engineering Hall, Urbana, Ill. (June '16) *Director '37–'39.*

Babcock & Wilcox Co., The, J. B. Romer, Barberton, Ohio (Assoc. M. May '24)

Bacharach, E. W., & Co., E. W. Bacharach, Pres., 800 Rialto Bldg., Kansas City, Mo. (Assoc. M. Apr. '40)

Bachmann, Frank, The Dorr Co., 570 Lexington Ave., New York, N. Y. (Feb. '15)

Badger, H. F., Secy., Board of Fire Underwriters of the Pacific, 914 Merchants Exchange Bldg., San Francisco, Calif. (Aug. '25)

Badger Meter Mfg. Co., 841-7—30th St., Milwaukee, Wis. (Assoc. M. June '04)

Badley, Harry W., Repr., Neptune Meter Co., 969 Highland St., Salina, Kan. (May '28)

Bahlman, Clarence, Water Purif. Supervisor, Cincinnati Filtration Plant, California, Ohio (Feb. '22)

Bailey, James G., Chem. Engr., Worthington, Ind. (Jan. '40)

Bailey, Wm. T., Chemist, City Water Dept., Broadway Pumping Station, Council Bluffs, Iowa (Jan. '32)

Bain, Ernest B., 120 New Bern Ave., Raleigh, N. C. (June '04)

Baity, H. G., Prof. of San. & Munic. Eng., Univ. of North Carolina, Chapel Hill, N. C. (May '23) *Fuller Award '40.*

Baker, Arthur, *see* LaPorte Water Works

Baker, Chester L., Chem. Dept., Philadelphia Quartz Co., 121 S. Third St., Philadelphia, Pa. (Jan. '39)

Baker Depts. of Water, Fire & Sanitation, Al. Blaylock, Comr., City Hall, Baker, Ore. (Corp. M. Jan. '39)

Baker, G. H., *see* North York, Township of

Baker, Harold J., *see* Fishers Island Farms, Inc.

Baker, H. L., Jr., 3233 McKinney Ave., Dallas, Tex. (Jan. '39)

Baker, Harold W., City Mgr., Rochester, N. Y. (Jan. '22)

Baker, M. N., 53 Oakwood Ave., Upper Montclair, N. J. (June '03) *Honorary M. '36.*

Baker, R. H. Co., Inc., W. H. Prescott, 2070 E. Slauson Ave., Huntington Park, Calif. (Assoc. M. Oct. '39)

Bakke, O. M., Chemist, Houston Labs., Box 132, Houston, Tex. (Oct. '39)

Baldwin, F. O., Supt., Water Purif. Plant, Westover Hills, Richmond, Va. (May '22)

Baldwin, L. A., Staff Mgr., Industrial Dept., Johns-Manville Sales Corp., 22 East 40th St., New York, N. Y. (Apr. '39)

Baldwin, Robert Lee, Burns & McDonnell Engineering Co., 107 W. Linwood Blvd., Kansas City, Mo. (Nov. '25)

Baldwin, Robert T., Secy., Chlorine Institute, Inc., 50 E. 41st St., New York, N. Y. (July '24)

Baldwin, T. H., City Engr., Cheyenne, Wyo. (May '34)

Ball, Edmund Bruce, Eldo House, Monkton, Prestwick, Scotland (Jan. '24)

Ball, Edward, Supt., Municipal Water Works, Bracebridge, Ont., Can. (Jan. '36)

Ballard, James I., Editor, *Western Construction News,* 333 Kearny St., San Francisco, Calif. (Oct. '37)

Balliston Spa Water Dept., E. R. Donohue, Supt., Box 177, Balliston Spa, N. Y. (Corp. M. July '39)

Ballou, Arthur Francis, Engr., National Board of Fire Underwriters, 85 John St., New York, N. Y. (Aug. '24)

Bamford, J. H., Supt., Water Dept., Dayton, Wash. (Jan. '37)

Banks, Russell S., Local Supt., Ohio Water Service Co., Marysville, Ohio (Apr. '39)

Banks, William G., Div. Engr., Div. of Water, Newark, N. J. (Dec. '19) *Fuller Award '39.*

Bankson, Ellis E., The Chester Engrs., 6562 Bartlett St., Pittsburgh, Pa. (July '22)

Banta, A. Perry, Asst. Engr., Los Angeles County Sanitation Dist., 110 S. Broadway, Los Angeles, Calif. (Oct. '38)

Barada & Page, Inc., W. M. Betts, Guinotte & Michigan Aves., Kansas City, Mo. (Assoc. M. Oct. '39)

Barbee, Edwin W., Water Purif. Engr., 1918 Carmelita Drive, San Carlos, Calif. (Jan. '36)

Barber, B. P., Munic. Engr., Tomlinson Eng. Co., 1226 Sumter St., Columbia, S. C. (Apr. '40)

Barber, W. J., Asst., Metropolitan Utilities Water Dept., Utilities Bldg., Omaha, Neb. (Jan. '38)

Barbour, Frank A., Hydr. & San. Engr., 1120 Tremont Bldg., Boston, Mass. (May '06) *Director '33–'35, '37. President '36. Honorary M. '39.*

Bardwell, C. M., 2201 Fairfax St., Denver, Colo. (July '26)

Bardwell, R. A., Service Engr.-Water Chemist, 8048 S. Carpenter St., Chicago, Ill. (Jan. '38)

Bardwell, R. C., Supt., Water Supply, Chesapeake & Ohio R.R. Co., Richmond, Va. (Nov. '16) *Director '41–'43.*

Barham, George Basil, Mng. Editor, *Contract Journal,* 127 Temple Chambers, Temple Ave., London, E. C. 4, England (Affil. Jan. '39)

Barker, J. R., Pacific Coast Mgr., Neptune Meter Co., 320 Market St., San Francisco, Calif. (June '26)

Barker, Stanley T., Asst. San. Engr., N. Y. State Dept. of Health, State Office Bldg., Albany, N. Y. (Jan. '40)

Barker, Thomas, Supt., Ashland City Water Works, Ashland City, Tenn. (July '39)

Barksdale, John C., Western Sales Mgr., Lynchburg Foundry Co.,

1316 Peoples Gas Bldg., Chicago, Ill. (Jan. '39)

Barnard, Russell E., Advisory Engr., Spiral Welded Pipe Dept., American Rolling Mill Co., Middletown, Ohio (Oct. '39)

Barnard, W. O., Supt., Woodfin San. Water & Sewer Dist., Route 1, Asheville, N. C. (Oct. '39)

Barnes, Charles E., Supt., Elwood Water Co., Elwood, Ind. (Jan. '37)

Barnes, George E., Prof. of Hydr. & San. Eng. and Head, Dept. of Civ. Eng., Case School of Applied Science, Cleveland, Ohio (Jan. '36)

Barnes, W. E., City Engr. & Supt. of Water Works, City Hall, Liberty, Mo. (Apr. '40)

Barnhill, Kenneth G., Sales Engr., The Permutit Co., 330 W. 42nd St., New York, N. Y. (July '39)

Barr, Carl F., *see* Two Harbors, City of

Barraneche, Leopoldo Delgardo, Quimico-Supt. de Plantas, Acueducto de Santa Marta, Santa Marta, Colombia, S. A. (Jan. '39)

Barrett, Jack P., Chemist, 4638 Virginia, Kansas City, Mo. (Apr. '40)

Barrett Co., The, George B. McComb, 40 Rector St., New York, N. Y. (Assoc. M. Jan. '37)

Barrick, M. J., Dist. Engr., Pennsylvania Dept. of Health, 724 First Ave., Williamsport, Pa. (Feb. '24)

Barrie Public Utilities Com., George F. Smith, Supt., Water Dept., P. O. Box 334, Barrie, Ont., Can. (Corp. M. July '35)

Barron, A. F., 59 E. Van Buren St., Chicago, Ill. (Sept. '28)

Barron, J. L., *see* Nassau County Dept. of Health

Barstow, Eugene D., San. Engr., 31 N. Summit St., Akron, Ohio (Jan. '36)

Barth, J. Arthur, Mng. Clerk, Room 308-Terminal Bldg., Broad St., Rochester, N. Y. (July '35)

Bartlett, Terrell, The Terrell Bartlett Engrs., Smith-Young Tower, San Antonio, Tex. (June '23)

Barton, Harry, Supt., Pittsburgh Suburban Water Service Co., 11 Meade Ave., Bellevue, Pa. (Dec. '28)

Bartow, Edward, Prof. of Chemistry & Chem. Eng., State Univ. of Iowa, Iowa City, Iowa (June '06) *Trustee '14, '15. Vice-Pres. '21. President '22. Exec. Com. '23, '24. Honorary M. '36.*

Bartuska, James F., Supt., Water Dept., 1642—119th St., Whiting, Ind. (Oct. '24)

Barwell, Fred, *see* Merritton Public Utilities Com.

Basom, G. E., Supt., Water & Light Com., Fairmont, Minn. (June '27)

Bassett, Carrol P., Civ. Engr., Summit, N. J. (Oct. '09)

Bassett, Charles K., Mech. Engr., Buffalo Meter Co., 2917 Main St., Buffalo, N. Y. (June '21)

Bassett, Geo. B., Civ. Engr., 691 W. Ferry St., Buffalo, N. Y. (Apr. '09)

Batavia, City of, Floyd A. Emery, Supt. of Water, City Hall, Box 358, Batavia, N. Y. (Corp. M. Apr. '37)

Bates, Francis, *see* Vernon, City of

Bates, R. W., Foreman, Water Production, Public Service Dept., 1010 N. Olive Ave., Burbank, Calif. (Oct. '37)

Bates, Ralph D., State Dept. of Health, 65 Court St., Buffalo, N. Y. (Feb. '21)

Baton, Warren U. C., Chief Analyst, 528 S. Lang Ave., Pittsburgh, Pa. (Apr. '09)

Baty, J. Bernard, Asst. Prof. of San. Eng., Queen's Univ., Kingston, Ont., Can. (Apr. '37)

Bauer, L. G., 1327—8th Ave., San Francisco, Calif. (Mar. '31)

Baumann, Hugo B., Supt. of Filtration Plant, 1017 Clinton Ave., St. clair, Mich. (Oct. '38)

Baumgartner, William H., Engr., Sales Technologist Div., E. I. Du Pont de Nemours & Co., Grasselli Chemicals Dept., Wilmington, Del. (Jan. '36)

Baxter, George, Depute City Water Engr., City Water Dept., 6 Cockburn St., Edinburgh, 1, Scotland (Jan. '28)

Bayerd, Forrest G., Water Comr., Dillon Water Works, City Hall, Dillon, Mont. (July '34)

Bayley, Edgar A., Engr. of Surveys, Dept. of Water & Power, Box 3669 Terminal Annex, Los Angeles, Calif. (June '28)

Baylis, John R., Physical Chemist, Bureau of Eng., 1643 E. 86th St., Chicago, Ill. (Oct. '15) *Goodell Prize '32. Fuller Award '39.*

Beacham, J. G., City Engr. & Supt. of Water Works, Athens, Ga. (Dec. '30)

Beal, R. B., Pres., The Flox Co., 1409 Willow St., Minneapolis, Minn. (June '27)

Bean, George L., Civ. Engr., 201 N. Broad St., Philadelphia, Pa. (Dec. '13)

Bear, Ernest J., *see* Livingston Water Dept.

Beard, Kennan H., Asst. Mgr., Del Este Water Co., 726 Tenth St., Modesto, Calif. (Jan. '39)

Beardsley, H. M., *see* Elmira Water Board

Beatty, Earl E., 8186 Livernois Ave., Detroit, Mich. (Jan. '38)

Beatty, J. H., Supt., Eaton Water Works, Eaton, Ohio (Jan. '39)

Beatty, Roy L., Mgr., Glasgow Water Dept., Glasgow, Ky. (Jan. '40)

Bechert C. H., *see* Indiana Dept. of Conservation

Beck, A. N., Asst. San. Engr., Bureau of Sanitation, State Dept. of Public Health, Montgomery, Ala. (Apr. '38)

Becker, Burton E., Caretaker, Gloversville Water Works, R. F. D. 3, Gloversville, N. Y. (Affil. Jan. '40)

Becker, Charles H., Mgr., Hydrant & Valve Dept., R. D. Wood Co., 400 Chestnut St., Philadelphia, Pa. (Aug. '27) *Director '37–'39.*

Beckett, R. C., State San. Engr., Dover, Del. (Sept. '24)

Beckwith, Homer E., Dist. Mgr., The Pitometer Co., 2014 Mulberry St., Harrisburg, Pa. (Apr. '29)

Beeny, Raymond, Secy.-Treas., Alabama Gas Co., Watts Bldg., Birmingham, Ala. (Oct. '31)

Beerman, Paul, Asst. Engr., Civic Center, San Diego, Calif. (Oct. '38)

Behrman, A. S., Chem. Director, International Filter Co., 325 W. 25th Pl., Chicago, Ill. (Feb. '25)

Beiswanger, G. J., Cashier, City Water Dept., Box 958, Billings, Mont. (Jan. '40)

Belanger, Raphael, City Engr., Valleyfield, Que., Can. (Jan. '34)

Bell, Alexander, Pacific Coast Mgr., Wallace & Tiernan Co., Inc., 171 Second St., San Francisco, Calif. (Nov. '32)

Bell, E. Arthur, Borough Engr., Essex Fells, N. J. (July '37)

Bell, W. W., Northeastern Water & Elec. Serv. Corp., 61 Broadway, New York, N. Y. (July '35)

Bell, Willard J., Engr., Wallace & Tiernan Co., Inc., 614 Flour Exchange Bldg., Minneapolis, Minn. (May '30)

Belle Glade Water Works, F. W. Kelley, Supt., Belle Glade, Fla. (Corp. M. Jan. '39)

Bellenger, Ira W., Supt. Water Works, Phoenix, Ariz. (Jan. '38)

Belleville Public Utilities Com., Oswald H. Scott, Gen. Mgr., 277 Front St., Belleville, Ont., Can. (Corp. M. Apr. '34)

Bellingham Water Dept., Geo. A. Brock, Supt., Bellingham, Wash. (Corp. M. Jan. '40)

Beltz, John H., Bell & Beltz, Chemists, 3340 N. Broad St., Philadelphia, Pa. (Jan. '36)

Belyea, John F., Pres., Gordon & Belyea, Ltd., 101 Powell St., Vancouver, B.C., Can. (Mar. '34)

Benas, Benjamin, Supt., Richmond-Sunset Sewage Treatment Plant, 4545 Lincoln Way, San Francisco, Calif. (Oct. '34)

Bender, Geo. C., Jr., Sales Repr., National Meter Co., 1319 Maple St., Kalamazoo, Mich. (Apr. '39)

Bender, R. W., 2420 Birdsall St., Blue Island, Ill. (Apr. '34)

Benedict A. H., Technologist, The Asphalt Institute, 100 Bush St., San Francisco, Calif. (Oct. '39)

Benedict, Earl, Chemist, Hobart, Okla. (Oct. '39)

Benedict, Sydney J., Asst. Engr., Bureau of Water, 209 City Hall, Portland, Ore. (Dec. '28)

Bennett, Boyd A., Pres., Northeastern Water & Elec. Service Corp., 61 Broadway, New York, N. Y. (Jan '37)

Bennett, Richard, Hydr. Engr., Water Dept., 80 W. Willetta St., Phoenix, Ariz. (Apr. '29)

Bennett Schuyler M., Water Treatment Plant Operator, Bureau of Water Works & Supply, 3004 Petite Court, Los Angeles, Calif. (Oct. '32)

Bennett, Stanley, Supt., Wallaceburg Water Works System, Wallaceburg, Ont., Can. (Jan. '39)

Bennett, Walter, Supt. of Water Works, Box 732, Barnsdall, Okla. (Oct. '39)

Bequer y Herrera, Gustavo A., San. Engr., Calle 19 No. 711, Entre Paseo y a, Vedado, Havana, Cuba (July '38)

Bergman, Leonard A., Director of Water, City Hall, Buffalo, N. Y. (Jan. '38)

Bergman, R. D., 294 Forest Ave., Rye, N. Y. (Jr. M. Jan. '40)

Berkeley, Winston H., Plant Supt., 1002—13th Ave., Lewiston, Idaho (Jan. '39)

Berkey, Fred L., Supt., Water Dept., Tillamook, Ore. (Mar. '31)

Bernard, Hunter C., Chemist, Brunner, Mond Canada, Ltd., Amherstburg, Ont., Can. (Jan. '35)

Berner, G. T., Asst. Sales Mgr., Anaconda American Brass, Ltd., New Toronto, Ont., Can. (Jan. '37)

Bernhagen, Lewis O., Director of Sanitation, City Hall, Beaumont, Tex. (Mar. '17)

Bernhardt, Carl J., Dist. San. Engr., N. Y. State Dept. of Health, 501 Hotel Jamestown Bldg., Jamestown, N. Y. (Apr. '39)

Bernstein, Louis S., *see* Buffalo Niagara Electric Corp.

Berry, Albert E., Director, San. Eng. Div., Ontario Dept. of Health, 235 Gainsborough Rd., Toronto, Ont., Can. (June '20) *Fuller Award '38. Director '38-'40.*

Berry, C. Radford, 1215 N. Second St., Harrisburg, Pa. (June '34)

Berry, F. R., Engr., American Water Works & Elec. Co., 50 Broad St., New York, N. Y. (Apr. '23)

Besozzi, Leo, 314 Hammond Bldg., Hammond, Ind. (May '34)

Besselievre, Edmund B., Room 709, Edificio Volta, Avenida R. S. Pena 832, Buenos Aires, Argentina (Oct. '19)

Besterman, J. S., *see* Sewickley Comrs. of Water Works

Bethlehem Steel Co., H. O. Hill, Asst. Chief Engr., Bethlehem, Pa. (Assoc. M. June '24)

Betz, L. Drew, Chem. Engr., W. H. & L. D. Betz, 235 W. Wyoming Ave., Philadelphia, Pa. (Apr. '29)

Bevan, Lynne J., Cons. Engr., 15 Warren Place, Montclair, N. J. (July '36)

Beverly Hills Water Dept., Arthur Taylor, Mgr., Box 390, Beverly Hills, Calif. (Corp. M. Sept. '26)

Beyer, A. C., San. Engr. & Dist. Mgr., Wallace & Tiernan Sales Corp., 171 Second St., San Francisco, Calif. (May '34)

Bibelhausen, Louis A., Supt. of Filtration, Menominee Indian Mills, Neopit, Wis. (Jan. '33)

Biddle, Earl W., 149 Summit Rd., Elizabeth, N. J. (Oct. '37)

Bigelow, William Russell, Dist. Mgr., Western United Gas & Elec. Co., 1015 Chestnut St., Murphysboro, Ill. (Jan. '38)

Biggs, George W., Jr., Chief Engr., American Water Works & Elec. Co., 50 Broad St., New York, N. Y. (June '16)

Billings, L. C., Supt. & Chief Chemist, Water Purif. Plant, Dallas, Tex. (May '23)

Binet, George D., *see* Ramsey Water Works

Bingham & Taylor Corp., Joe H. Gardner, 575 Howard St., Buffalo, N. Y. (Assoc. M. Mar. '82)

Bingham, Christopher F., Columbia Alkali Corp., 3034 N. 16th St., Philadelphia, Pa. (Sept. '31)

Bingley, W. McLean, 4011 Monticello St., Richmond, Va. (Mar. '34)

Binkley, T. C., *see* Mountain View Suburban Water Co.

Binner, Fred E., Supt. of Conduits, Denver Munic. Water Works, R. 2, Box 158, Littleton, Colo. (Apr. '40)

Binzer, H. A., Water Comr., Water Dept., City Hall, Bellingham, Wash. (Affil. Jan. '40)

Birch Manufacturing Co., Wm. T. Birch, 1523 Sedgwick St., Chicago, Ill. (Assoc. M. May '16)

Bird-Archer Co., George H. Sill, 2030 N. Natchez Ave., Chicago, Ill. (Assoc. M. July '29)

Bird-Archer Co., Ltd., H. C. Harragin, Vice-Pres., McGill Bldg., Montreal, Que., Can. (Assoc. M. Oct. '37)

Bird, Byron, 408 Quackenbos St., N. W., Washington, D. C. (July '24)

Bird, Cyrus R., The Pitometer Co., 205 W. Wacker Drive, Chicago, Ill. (Mar. '22)

Birdsall, Lewis I., General Chemical Co., 105 W. Madison St., Chicago, Ill. (June '13)

Birkeness, O. T., San. Engr., 809 W. Washington St., Chicago, Ill. (May '30)

Birmingham Water Co., Malcolm M. Eckhardt, Gen. Mgr., 33 Elizabeth St., Derby, Conn. (Corp. M. May '09)

Bissett, J. C., *see* Corpus Christi, City of

Black, A. P., Prof. of Agric. Chem., Univ. of Florida, Gainesville, Fla. (Apr. '29) *Director '37–'39. Fuller Award '39.*

Black, Ben H., Sales Repr., F. W. Hanks Co., 1923 E. 73rd St., Cleveland, Ohio (Oct. '38)

Black, Ernest B., Cons. Engr., 4706 Broadway, Kansas City, Mo. (June '13)

Black, Hayse H., Asst. San. Engr., State Dept. of Public Health, 1605 S. Douglas Ave., Springfield, Ill. (Oct. '33)

Blackwelder, C. D., Box 1516, Greenville, S. C. (May '26)

Blaik, D. L., Salesman, Water Leak Detector Co., 166 N. 3rd St., Columbus, Ohio (Apr. '39)

Blair, Clarence M., Cons. Engr., P. O. Box 236, 100 Crown St., New Haven, Conn. (Jan. '38)

Blair, T. J., Jr., Vice-Pres. & Gen. Mgr., West Virginia Water Service Co., 814 Peoples Exchange Bldg., Charleston, W. Va. (Apr. '24)

Blair, W. R., Mgr., American Cast Iron Pipe Co., 302 Sharon Bldg., 55 New Montgomery St., San Francisco, Calif. (Oct. '37)

Blakeley, L. E., *see* Santa Ana Valley Irrigation Co.

Blakeman, S. R., Supt., Water & Light Plant, Dyersburg, Tenn. (Jan. '27)

Blanchard, R. K., Vice-Pres. & Engr., Neptune Meter Co., 50 W. 50th St., New York, N. Y. (June '19)

Blank, C., Supt. of Construction & Gen. Maint., Indianapolis Water Co., 113 Monument Circle, Indianapolis, Ind. (Jan. '40)

Blaylock, Al., *see* Baker Depts. of Water, Fire & Sanitation

Blezard, John W., Supt. of Water Works, Box 115, Kimberley, B. C., Can. (Apr. '38)

Blidberg, P. G., *see* Göteborgs Vattenledningsverk

Bliss, Harold P., Asst. Civ. Engr., Dept. of Water & Power, Box 3669 Terminal Annex, Los Angeles, Calif. (Sept. '31)

Bliven, Geo. H., *see* Monroe Avenue Water Dist.

Blizzard, George, Water Supt., Lamar, Colo. (Jan. '36)

Blohm, Arthur W. P., Asst. San. Engr., State Dept. of Health, 2206 Walbrook Ave., Baltimore, Md. (Aug. '22)

Blomquist, H. F., Supt., City Water Works, Cedar Rapids, Iowa (May '17)

Bloomfield, Town of, Jos. W. Obreiter, Town Engr., Bloomfield, N. J. (Corp. M. Oct. '37)

Blum, Louis D., C.P.A., 110 East 42nd St., New York, N. Y. (June '29)

Blumberg, Oscar C., Chemist, 1619 Lincoln Ave., San Jose, Calif. (Feb. '30)

Blundon, J. Paul, Cons. Engr., Law Bldg., Keyser, W. Va. (Apr. '30)

Boardman, William H., Civ. Engr., 426 Walnut St., Philadelphia, Pa. (Apr. '09)

Boarman, Owen, *see* Mineral Wells City Water Works

Boas, Carl H., Secy., Mt. Penn Suburban Water Co., 2227 Perk Ave., Reading, Pa. (July '35)

Bock, A. W., Mgr., Texas Water Co., Houston, Tex. (Oct. '39)

Boettiger, W. O., Salesman, Columbia Steel Co., Box 510, Arcade Station, Los Angeles, Calif. (Oct. '37)

Bogert, Clinton L., Cons. Engr., 30 Church St., Room 1725, New York, N. Y. (Jan. '24)

Boggs, Harry, C.P.A., 803 Electric Bldg., Indianapolis, Ind. (Mar. '30)

Bohmann, Henry P., Supt. of Water Works, Milwaukee, Wis. (May '13)

Boling, Fred, Supt., West Terre Haute Utilities Co., 500 National Ave., West Terre Haute, Ind. (Oct. '38)

Bolson, John W., *see* Oconomowoc Water Dept.

Bombin y Campos, Jose, Engr. in Charge of Water Supply, Public Works Dept., Jefatura de Obras Publicas, Camaguey, Cuba (July '38)

Boncher, Hector P., Sales Mgr., Dresser Mfg. Co., Bradford, Pa. (Jan. '37)

Bond, Horatio, Chief Engr., National Fire Protection Assn., 60 Batterymarch St., Boston, Mass. (July '39)

Bond, Robert M., Asst. Accountant, Munic. Section, Hydro-Elec. Power Com. of Ontario, 620 University Ave., Toronto, Ont., Can. (Apr. '38)

Boniface, Arthur, Village Engr. & Mgr., Popham & Post Rds., Scarsdale, N. Y. (Jan. '38)

Bonn, George S., Research Engr., City Water, Light & Power Dept., City Hall, Springfield, Ill. (Jan. '40)

Bonyun, Richard E., General Supt., Passaic Valley Water Com., 137 Ellison St., Paterson, N. J. (Oct. '35)

Booker, Warren H., Director, Div. of Sanitation, State Board of Health, Raleigh, N. C. (Dec. '31)

Boone Water Dept., Geo. A. Nelson, Supt., Boone, Iowa (Corp. M. Jan. '40)

Booth, George W., National Board of Fire Underwriters, 85 John St., New York, N. Y. (Feb. '24)

Booz, Louis P., Cons. Engr., 263 Madison Ave., Perth Amboy, N. J. (Jan. '37)

Borden, Moro M., 310 Lees Ave., Collingswood, N. J. (June '12)

Borgford, Th. B., Cons. Engr., 6887 Sherbrooke St., W., Montreal, Que., Can. (Jan. '37)

Bornemann, George F., Supt., Massapequa Water Dist., Central Ave., Massapequa, N. Y. (Apr. '38)

Botten, H. H., Asst. Mgr., Washington Survey & Rating Bureau, P. O. Box 1818, Seattle, Wash. (Jan. '24)

Boucher, George, Supt., Paris Public Utilities Com., Box 180, Paris, Ont., Can. (Apr. '38)

Bouey, Howard L., Const. Foreman, Los Angeles Dept. of Water & Power, 5938 Matilija St., Van Nuys, Calif. (Oct. '34)

Bouey, John H., Dist. Supt., Dept. of Water & Power, 14238 Friar St., Van Nuys, Calif. (Oct. '32)

Boulden, R. L., *see* Riverside Water Dept.

Boulder Water Dept., H. C. McClintock, City Mgr., Boulder, Colo. (Corp. M. Jan. '27)

Boulware, C. E., Supt., Munic. Water Works, Markle, Ind. (Affil. Jan. '39)

Bourbon Copper & Brass Works Co., 618 E. Front St., Cincinnati, Ohio (Assoc. M. Apr. '84)

Bourgin, Charles G., Asst. Supt., Bureau of Water Supply, 54 Watchung Ave., Montclair, N. J. (July '37)

Bourne, Don, 727 S. Stanley Ave., Los Angeles, Calif. (Apr. '39)

Bovard, Paul F., California Filter Co., 981 Folsom St., San Francisco, Calif. (Aug. '26)

Bow, Wilson F., San. Engr., Whatcom County Health Dept., Court House, Bellingham, Wash. (Affil. Jan. '39)

Bowe, Thomas F., Cons. Engr., 110 William St., New York, N. Y. (Feb. '20)

Bowen, Charles Stanley, 95 Wellington St., Kew, Melbourne, Victoria, Australia (Feb. '29)

Bowen, M. R., *see* Whittier, City of

Bowers, Herbert L., Service Mgr., The Permutit Co., 330 W. 42nd St., Room 200, New York, N. Y. (Jan. '36)

Bowker, J. S., Water Comr., Kearney, Neb. (July '35)

Bowling Green City Water Co., William Insull, Vice-Pres., 109 N. Main St., Bowling Green, Ohio (Corp. M. Jan. '39)

Bowman, Abraham M., Supt. of Public Utilities, Elmira, Ont., Can. (Oct. '19) *Fuller Award '39.*

Bowman, Harry B., 2642 Baird Blvd., Camden, N. J. (Jan. '38)

Bowser, Orval A., Supt. of Water Works, Box 21, Kittanning, Pa. (Apr. '40)

Boyce, Earnest, Chief Engr. & Director, Div. of Sanitation, State Board of Health, Lawrence, Kan. (Apr. '26)

Boyd, George E., New York Dist. Mgr., Wailes Dove-Hermiston Corp., 17 Battery Place, New York, N. Y. (May '31)

Boyd, H. W., Supt. Water Dept., Box 323, Williamstown, W. Va. (Affil. Jan. '39)

Boykin, H. P., Assoc. Prof. of Civ. Eng., Virginia Military Institute, Lexington, Va. (Oct. '34)

Boyle, John L., Mgr., Portland Office, Pacific States Cast Iron Pipe Co., 501 Spalding Bldg., Portland, Ore. (Jan. '35)

Boyles, Richard H., Mgr.-Resident Engr., Fox Chapel Authority, Fox Chapel Rd., Pittsburgh, Pa. (July '40)

Boynton, Perkins, Chemist-in-charge, Clarksburg Water Board, 315 S. Chestnut St., Clarksburg, W. Va. (June '20) *Fuller Award '40.*

Bozeman, City of, M. E. Henderson, City Mgr., City Hall, Bozeman, Mont. (Corp. M. Jan. '33)

Brackett, Woodbury E., Munic. Mgr., Middlebury Water Dept., Middlebury, Vt. (Jan. '39)

Brackney, Fred, *see* Canon City

Bradley, J. F., Chief Engr., R. F. D. 8, Valparaiso, Ind. (Feb. '21)

Bradner, E. A., *see* New Mexico Power Co., Agua Pura Div.

Bragg, George H., Engr. of Maintenance, 245 Market St., San Francisco, Calif. (Oct. '22)

Braidech, Mathew M., Assoc. Prof. of Ind. & San. Chemistry, Case School of Applied Science, University Circle, Cleveland, Ohio (May '30) *Goodell Prize '36.*

Brainard, Elliott E., Asst. Secy., Lock Joint Pipe Co., Box 21, Ampere, N. J. (Jan. '37)

Brainard, F. S., & Co., Frank S. Brainard, Jr., Vice-Pres., 246 Palm St., Hartford, Conn. (Assoc. M. Jan. '39)

Brainard, Frank S., Sr., Distr. Engr., Water Bureau Metropolitan Dist. Com., Pilgard Bldg., 1026 Main St., Hartford, Conn. (Apr. '39)

Brakenridge, C., City Engr., City Hall, Vancouver, B. C., Can. (Nov. '23)

Brandis, Fred E., Supt., Munic. Water Works, Blaine Co., Chinook, Mont. (Mar. '25) *Fuller Award '39.*

Brandriff, Alfred, *see* Millville Water Co.

Brannock, D. York, Chem. Engr. in Charge of Water Works & Sewage Disposal Plant, 315 Vance St., Laurinburg, N. C. (Oct. '39)

Branson, William S., Supt., Munic. Light & Water Plant, Municipal Bldg., Madisonville, Ky. (Jan. '40)

Brantford Public Utilities Com., C. A. Waterous, Brantford, Ont., Can. (Corp. M. May '14)

Brantly, E. C., Mgr., Water, Gas & Elec. Depts., Danville, Va. (Feb. '27)

Braun, E. J., *see* Fond du Lac City Water Dept.

Bready, Ira J., Sales Engr., The Permutit Co., 3119 Griest Ave., Cincinnati, Ohio (Jan. '38)

Breitenbach, William E., Chem. Engr. in Charge of Technical Dept., Rayonier Inc., Grays Harbor Div., Hoquiam, Wash. (July '40)

Breithaupt, J. C., *see* Kitchener Water Com.

Breitkreutz, E. W., Asst. Engr., Pipe Construction, Dept. of Water & Power, 410 Ducommun St., Los Angeles, Calif. (Oct. '29)

Breniman, E. H., Water Dept. Supt., P. O. Box 125, Parco, Wyo. (Jan. '38)

Brennan, Ralph F., Chemist & Chief Operator, Munic. Water Treatment Plant, Daytona Beach, Fla. (Jan. '38)

Brenneke, A. M., City Engr., Denison, Tex. (Oct. '34)

Bretz, C. E., 1221 N. Penna Ave., Oklahoma City, Okla. (Aug. '23)

Brickenden, F. M., Dist. Engr., Dept. of National Health, 66 Ethelbert St., Winnipeg, Man., Can. (June '28)

Brickey, M. L., Gen. Mgr., Knox County Water Co., Fountain City, Tenn. (July '35)

Bridle, R. M., P. O. Box 377, Goderich, Ont., Can. (Affil. Jan. '40)

Briggs, W. A., Bitumen Co., Inc., W. Ronald Briggs, 3303 Richmond St., Philadelphia, Pa. (Assoc. M. Jan. '35)

Bright, Marshall, Supt. of Filtration, Pacific Mills, 9 Upland St., Lyman, S. C. (Jan. '39)

Brinkerhoff, Marvin J., Secy., Bogota Water Co., 78 W. Main St., Bogota, N. J. (July '38)

Brisbane, Eugene C., S. Morgan Smith Co., York, Pa. (Jan. '36)

Bristol, City of, R. J. Mottern, Comr., Dept. of Streets & Public Property, Bristol, Tenn. (Corp. M. July '38)

Bristol, City of, Asher W. Harman, City Mgr., Bristol, Va. (Corp. M. Jan. '40)

Bristol Co., The, L. C. Bran, Waterbury, Conn. (Assoc. M. Jan. '40)

Bristol, H. C., 501 Maury St., Alcoa, Tenn. (July '35)

Bristol, Theodore L., Pres. & Mgr., Ansonia Water Co., 354 Main St., Ansonia, Conn. (June '34)

Brock, George A., *see* Bellingham Water Dept.

Brito filho, F. Saturnino R. de, San. Engr., Caixa Postal 1631, Rio de Janeiro, Brazil, S. A. (May '30)

Britton, J. C., Supt., Avon Lake Water Dept., Groveland Drive, Avon Lake, Ohio (Affil. Jan '40)

Brodbeck, Chas., Supt., Water Works, Decatur, Ind. (Apr. '40)

Bromschwig, A. C., Salesman, Hersey Manufacturing Co., 5605—11th Ave., S., Minneapolis, Minn. (Apr. '39)

Brooks, Fred, Foreman, Distr., Operation & Construction Div., Bureau of Water Works & Supply, 1308 Micheltorena St., Los Angeles, Calif. (Apr. '36)

Brooks, John N., 339 Bellevue Ave., Trenton, N. J. (Feb. '12)

Brooks, R. H., Supt., Light & Water Dept., Ruston, La. (Oct. '34)

Brooks, Thomas, 2045 N. Catalina St., Los Angeles, Calif. (Sept. '25) *Honorary M. '37.*

Brothers, J. K., Supt., City Water Dept., 1206 N. 1st St., Monroe, La. (July '35)

Brotz, J. K., *see* Silver Creek Water Works

Broughman, Russell, Bureau of Eng., State Bd. of Health, P. O. Box 210, Jacksonville, Fla. (July '35)

Brower, Claude L., Supt., Water & Light Dept., Milton, Ore. (Jan. '40)

Brown, C. E., Mgr., Public Utilities Com., Meaford, Ont., Can. (Mar. '32)

Brown, C. U., Mgr., Water Dept., Box 208, Cass City, Mich. (Affil. Jan. '39)

Brown, Carl N., Asst. Western Sales Mgr., U. S. Pipe & Foundry Co.,

122 S. Michigan Ave., Chicago, Ill. (Oct. '39)

Brown, Chrystal, *see* North Jersey Dist. Water Supply Com.

Brown, Claude R., Mgr., American Cast Iron Pipe Co., 412 W. 6th St., Room 1204, Los Angeles, Calif. (Aug. '31)

Brown, Cleo E., Supt., Munic. Water Plant, 711 N. Independence St., Harrisonville, Mo. (July '39)

Brown, E. W., *see* Kentucky Utilities Co.

Brown, Edward, Supt. of Water Works, Eau Claire, Wis. (Jan. '21)

Brown, G. M., Supt. of Public Works, City Hall, Mullens, S. C. (Oct. '39)

Brown, Herbert H., Civ. Engr., % City Engr., City Hall, Milwaukee, Wis. (Nov. '29) *Director '41–'43.*

Brown, H. L., *see* Salina Water Dept.

Brown, Horace A., Cons. Engr. & Supt. of Water Works, Ottumwa, Iowa (June '11)

Brown, J. B., Pres., Erwin Water Co., Erwin, Tenn. (Apr. '40)

Brown, J. O., Mgr., Pump & Eng. Dept., Crane-O'Fallon Co., 1631 Fifteenth St., Denver, Colo. (Jan. '30)

Brown, James R., National Water Main Cleaning Co., 205 W. Wacker Drive, Chicago, Ill. (July '34)

Brown, John D., Water Comr., City Water Dept., Enid, Okla. (Oct. '39)

Brown, John L., Jr., Supt., Cannon Mills Co., Box 242, Concord, N. C. (Jan. '39)

Brown, Kenneth W., San. Engr., California Water Service Co., Stockton, Calif. (July '27)

Brown, L. V. Z., Sales Engr., Wallace & Tiernan Co., Inc., 3900 Purdue St., Dallas, Tex. (July '38)

Brown, M. W., *see* Orlando Public Utilities Com.

Brown, Robert F., Plant Mgr., California Water Service Co., Stockton, Calif. (Aug. '30)

Brown, Walter M., Office Engr., Long Beach Water Dept., 400 Municipal Utilities Bldg., Long Beach, Calif. (May '34)

Browne, F. G., *see* Teck, Township of

Brownell, O. E., San. Engr., State Dept. of Health, Div. of Sanitation, University Campus, Minneapolis, Minn. (Apr. '32)

Browning, Robert T., Wallace & Tiernan Co. Inc., Newark, N. J. (Apr. '36)

Brownlee, H. A., Water Supt., City Hall, West Monroe, La. (July '39)

Brownson, Bruce, City Mgr., City Hall, Grand Junction, Colo. (Jan. '40)

Brownstead, J. P., Supt. of Water Works, 921 Prospect Place, Ashland, Ky. (Apr. '38)

Broyles, William Lebeck, Filtration Plant Operator, California Water & Telephone Co., 3590—44th St., San Diego, Calif. (Jan. '39)

Broz, Frank J., Supt. of Water, Town Hall, 2517 S. 50th Ave., Cicero, Ill. (Aug. '33)

Bruden, C. O., Wallace & Tiernan Co. Inc., 432—119 E. Washington Ave., Madison, Wis. (Mar. '29)

Bruhn, Alfred H., San. Engr., Carrera 5A, Calle 16, Bogota, Colombia, S. A. (Apr. '38)

Brumbaugh, W. V., Secy., National Lime Assn., 927—15th St., N. W., Washington, D. C. (Mar. '29)

Brune, Fred H., Sales Mgr., Rensselaer Valve Co., Monadnock Bldg., Chicago, Ill. (Sept. '31)

Brunstein, Maurice, Chem. Engr., Bureau of Health, 311 City Hall Annex, Atlantic City, N. J. (July '35)

Brunton, Chas. L., Supt., Jackson Mutual Water Co., R. #1, Jackson, Ohio (July '35)

Brush, Frederick Clinton, Mgr., Bound Brook Water Co., 519 Watchung Rd., Bound Brook, N. J. (Jan. '24)

Brush, Wm. W., 440 Park Ave., New York, N. Y. (Feb. '11) *Treasurer '22-'27, '30-. Vice-Pres. '28. President '29. Diven Medal '32. Honorary M. '37.*

Bryan, Wayne G., Supt., Water Dept., Portage, Wis. (July '37)

Buccowich, Paul, Jr., Supt., Light & Water Dept., Ely, Minn. (May '33)

Buchanan, Edward Victor, Gen. Mgr., Public Utilities Com., London, Ont., Can. (Apr. '26)

Buchanan, Gerrit S., R. D. No. 5, Washington, Pa. (June '30)

Buchanan, Hugh, Cia Consolidada de Aguas, Corrientes del Rosario Ltda., Rosario, de Santa Fe, Argentina (June '24)

Buck, George H., Cons. Engr., Nicholas S. Hill Associates, 55 Cherry St., Elizabeth, N. J. (Jan. '26)

Buckingham, J. E., Supt. & City Engr., Water Dept., Raymond, Wash. (Apr. '39)

Buffalo Div. of Water, Leonard A. Bergman, 107 City Hall, Buffalo, N. Y. (Corp. M. June '21)

Buffalo Meter Co., Chas. K. Bassett, 2917 Main St., Buffalo, N. Y. (Assoc. M. June '05)

Buffalo Niagara Elec. Corp., Louis S. Bernstein, Electric Bldg., Buffalo, N. Y. (Corp. M. Apr. '37)

Bugbee, Alvin, Supt. & Engr., Trenton Water Dept., 565 Rutherford Ave., Trenton, N. J. (July '39)

Buhler, William, Town Mgr., Wray, Colo. (Oct. '37)

Builders Iron Foundry, Chas. D. Richardson, 9 Codding St., Providence, R. I. (Assoc. M. June '01)

Bull, E. V., Mayor & Chairman, Board of Public Works, Linton Munic. Water Dept., Linton, Ind. (Oct. '39)

Bull, Irving C., Cons. Chemist, 86 Highland Ave., Middletown, N. Y. (June '06)

Bullock, DeWitt H., Supt. of Water System, 80 Walnut St., Canajoharie, N. Y. (Jan. '28)

Bundy, Dan E., Topographical Draftsman, Dept. of Water & Power, Box 3669 Terminal Annex, Los Angeles, Calif. (Apr. '38)

Bunker, George Cyrus, Cons. Engr., % American Consulate, Caracas, Venezuela, S. A. (Feb. '11)

Bunker, H. K., Supt., Water & Sewer Dept., Chewelah, Wash. (Affil. Apr. '38)

Bunnell, Kenneth J., Asst. Chemist., Metropolitan Utilities Dist., 5335 N. 25th Ave., Omaha, Neb. (June '34)

Burack, William D., Engr., Wallace & Tiernan Products Co., Inc., 90 Sycamore Ave., Livingston, N. J. (Jan. '36)

Buratti, Carl, Johns-Manville Sales Corp., 1207 Architects Bldg., Los Angeles, Calif. (Jan. '38)

Burbank Public Service Dept., J. H. McCambridge, Gen. Supt., 174 S. Magnolia Blvd., Burbank, Calif. (Corp. M. June '27)

Burchard, Edwin Day, Dist. Engr., U. S. Geological Survey, 220 Post Office Bldg., Asheville, N. C. (Jan. '25)

Burden, Martin L., Cons. Engr., 103½ S. Harrison St., Alexandria, Ind. (Oct. '39)

Burdick, Charles B., Hydr. & San. Engr., 1401 Civic Opera Bldg., Chicago, Ill. (July '07)

Burgess, George S., *see* New Jersey State Water Policy Com.

Burgess, John, Office Engr., Board of Water Com., Box 629, Denver, Colo. (Oct. '37)

Burgess, Philip, Cons. Engr., 568 E. Broad St., Columbus, Ohio (Apr. '11)

Burnett, F. T., P. O. Box 522, Susanville, Calif. (July '35)

Burnett, H. A., Jr., Bacteriologist, Difco Labs., Inc., 920 Henry St., Detroit, Mich. (Jan. '36)

Burnett, K. J., Sales Repr., Lynchburg Foundry Co., Lynchburg, Va. (Jan. '40)

Burnie, Arthur N., Vice-Pres. & Treas., Beaver Valley Water Co., 1425—8th Ave., Beaver Falls, Pa. (Mar. '16)

Burns, Lucien P., Mayor, Selma, Ala. (Apr. '39)

Burns, Ross J., 4549 Lawn Ave., Western Springs, Ill. (Oct. '38)

Burns, Thomas M., Asst. Mgr.-Sales, Alco Products, Div. of American Locomotive Co., 30 Church St., New York, N. Y. (Apr. '35)

Burnson, Blair I., East Bay Munic. Utility Dist., 2079 Oakland Ave., Piedmont, Calif. (Jan. '35)

Buroker, H. M., Mgr., Light & Water Dept., Bonners Ferry, Idaho (Jan. '39)

Burr, Maurice H., P. O. Box. O, Northeast Harbor, Me. (Apr. '36)

Burris, Milton D., Dept. of Water & Power, Room 858, Box 3669 Terminal Annex, Los Angeles, Calif. (Jan. '34)

Burroughs Adding Machine Co., A. S. Trew, Public Utilities Sales, Second Blvd., Detroit, Mich. (Assoc. M. Mar. '26)

Burton, H. K., *see* Salt Lake City Water Dept.

Burwell, John H., *see* Schenectady, City of

Bushnell, Charles A., 19 John St., Westfield, N. J. (Apr. '37)

Buswell, A. M., Chief, State Water Survey Div., Urbana, Ill. (Mar. '16)

Butler, T. C., Jr., Hydr. Engr., Pomona Pump Co., 106 S. E. Hawthorne Blvd., Portland, Ore. (Jan. '40)

Buttler, L. S., Div. Mgr., Northeastern Water & Elec. Service Corp., West End of Walnut St. Bridge, Lemoyne, Pa. (Jan. '39)

Byers, A. M., Co., M. J. Czarniecki, Vice-Pres., Clark Bldg., Pittsburgh, Pa. (Assoc. M. June '21)

Byers, Chester A., Asst. to Gen. Mgr., Johnstown Water Co., 52 Shady Lane, Johnstown, Pa. (Apr. '37)

Byrne, Walter S., General Mgr., Metropolitan Utilities Dist., Utilities Bldg., Omaha, Neb. (Oct. '39)

Byrom, Geo. L., *see* Houston Water Dept.

Byron, M. B., Water Comr., Water Dept., P. O. Box 443, Bellingham, Wash. (Affil. Apr. '40)

Byron Jackson Co., D. W. Conkling, P. O. Box 1307, Arcade Station, Los Angeles, Calif. (Assoc. M. Sept. '24)

Cadman, Robert M., 244 Cambridge Ave., Red Bank, N. J. (May '24)

Cadmus, Peter H., Supt. of Shops & Meters, Water Dept., City Hall, East Orange, N. J. (Affil. Oct. '38)

Cady, H. R., Mech. Engr., Hackensack Water Co., 624 Park Ave., Weehawken, N. J. (June '29)

Cady, Lowell, Engr., Wiedeman & Singleton, 712 Cumberland Circle, N.E., Atlanta, Ga. (Jan. '40)

Cain, Giles L., Supt., City Water Works, 224 N. Main St., South Bend, Ind. (Jan. '39)

Caird, James M., Chemist & Bacteriologist, Cannon Bldg., Broad-

way & 2nd St., Troy, N. Y. (May '00) *Treasurer '14-'21.*

Calcavecchia, Stefano, Cons. Engr., Edificio La Metropolitana 310, Havana, Cuba (July '38)

Caldwell, H. L., Cons. Engr., Caldwell Eng. Co., Jacksonville, Ill. (Apr. '36)

Caldwell, James A., Rushville, Ind. (Apr. '36)

Calgon, Incorporated, Everett P. Partridge, Director of Research, Bowman Bldg., Pittsburgh, Pa. (Assoc. M. Jan. '39)

California Corrugated Culvert Co., Claude T. Faw, Fifth & Parker Sts., West Berkeley, Calif. (Assoc. M. Aug. '27)

California Oregon Power Co., The, Harry Olsen, Medford, Ore. (Corp. M. Apr. '40)

California Water & Telephone Co., Fred J. Hodges, P. O. Box 1, National City, Calif. (Corp. M. June '26)

Callahan, Harry C., Pres., Lake Mohawk-Sparta Water Co., White Deer Plaza, Sparta, N. J. (Jan. '37)

Callan, John, *see* Tennessee Eastman Corp.

Calvert, Carlos M., *see* Cuba, Cia de Acueducto de, Cuba, S. A.

Calvert, Cecil K., Supt. of Purif., Indianapolis Water Co., 113 Monument Circle, Indianapolis, Ind. (Nov. '20) *Director '41-'43.*

Cambi, Franco, Engr., P. Leonardo da Vinci, 7, Milan, Italy (Jan. '37)

Camden County Vocational School, Jos. M. Hall, Director, Chemistry Dept., 6008 Browning Rd., Merchantville, N. J. (Corp. M. July '39)

Cameron, W. J. D., Civ. Engr., Anthes Foundry, Ltd., Saskatchewan Ave., Winnipeg, Man., Can. (Jan. '40)

Camp, Thos. R., Assoc. Prof. of San. Eng., Massachusetts Institute of Technology, Cambridge A, Mass. (Jan. '30)

Campbell, A. E., Supt., Water Dept., 136—13th St., Cloquet, Minn. (July '35)

Campbell, Elmer W., State Dept. of Health, Augusta, Me. (Dec. '23)

Campbell, Geo. A., *see* Sierra Pacific Power Co.

Campbell, Glen W., Chemist, Water Dept., 710 Forest St., Bellingham, Wash. (Apr. '38)

Campbell, H. A., Supt. of Public Activities, Cornwall, Ont., Can. (Apr. '33)

Campbell, John T., The Chester Engrs., Century Bldg., 130 Seventh St., Pittsburgh, Pa. (Oct. '31)

Campbell, John W., Supt., Water Works, Ridgetown, Ont., Can. (Dec. '33)

Campbell, Joseph D., Supt., Merchantville-Pennsauken Water Com., 13 W. Maple Ave., Merchantville, N. J. (Oct. '38)

Campbell, M. S., Asst. State Public Health Engr., 1412 Smith Tower, Seattle, Wash. (Apr. '38)

Camy, L. L., Local Mgr., California Water Service Co., 4013 Whittier Blvd., Los Angeles, Calif. (May '30)

"Canadian Engineer, The," 341 Church St., Toronto 2, Ont., Can. (Assoc. M. May '16)

Canariis, Svend A., Elec. Engr., Pomona Pump Company, 120 Broadway, New York, N. Y. (July '37)

Cannon, Samuel C., *see* Middletown Water Dept.

Canon City, Fred Brackney, Water Supt., Box 407, Canon City, Colo. (Corp. M. Apr. '26)

Cantley, C. G., Operator, Clendenin Water Co., Inc., Clendenin, W. Va. (Affil. Jan. '40)

Canton Munic. Utilities, Water Works Dept., W. M. Reid, P. O. Box 114, Canton, Miss. (Corp. M. Jan. '39)

Cantrell, E. L., Dist. Mgr., Neptune Meter Co., 815 W. Market St., Louisville, Ky. (Apr. '39)

Capen, Charles H., Jr., Engr., North Jersey District Water Supply Com., 8 Florence Place, West Orange, N. J. (Apr. '30) *Fuller Award '38.*

Caplan, Louis R., Sales Engr., Calgon, Inc., 5900 Oxford St., Philadelphia, Pa. (Oct. '39)

Capron, John D., Pres., Glamorgan Pipe & Foundry Co., Lynchburg, Va. (Jan. '24)

Carlson, Alex, Water Dept. Supt., Ketchikan Public Utilities, Ketchikan, Alaska (Apr. '40)

Carlton Frank, Sales Engr., Lohman Bros., 1449 S. San Pedro St., Los Angeles, Calif. (Oct. '39)

Carmichael, David W., Engr. & Supt., Water Dept., 69 Llewellyn Ave., Hawthorne, N. J. (Oct. '39)

Carmien, R. P., Coast Agent, Golden-Anderson Valve Specialty Co., 1800 Canyon Drive, Los Angeles, Calif. (Oct. '34)

Carnahan, R. D., Operator, Bradenton Water Dept., 1209—12th St., Bradenton, Fla. (Affil. Jan. '40)

Carns, James G., Jr., Mgr., Bristol County Water Co., Bristol, R. I. (Oct. '35)

Carollo, John A., Const. Engr., Headman, Ferguson & Carollo, 319 Homebuilders Bldg., Phoenix, Ariz. (Jan. '39)

Carpenter, George, Supt., Water Dept., Municipal Water Bldg., Ithaca, N. Y. (Jan. '35)

Carpenter, W. N., Supt. of La Canada Irrigation Dist., P. O. Box 162, La Canada, Calif. (Oct. '38)

Carr, J. A., Supt., Village Water Dept., Ridgewood, N. J. (May '16)

Carroll, Eugene, Vice-Pres. & Mgr., Butte Water Co., Butte, Mont. (June '04) *Director '31.*

Carroll, Hugh J., Engr. of Water Extension, City Hall, Yonkers, N. Y. (Apr. '31)

Carroll, John J., 5255 Carrollton Ave., Indianapolis, Ind. (Jan. '38)

Carson-Cadillac Corp., H. Y. Carson, Pres., P. O. Box 67, Tarrant Branch, Birmingham, Ala. (Assoc. M. Jan. '37)

Carter, Earl L., Cons. Engr., 814 Electric Bldg., Indianapolis, Ind. (Dec. '32)

Carty, J. V., Secy., Ohio Water Service Co., 235 State St., Struthers, Ohio (Jan. '36)

Cary, E. S., Supt. of Water Works, Evansville, Wis. (Oct. '35)

Casad, Charles C., City Engr. & Supt., Water Dept., City Hall, Bremerton, Wash. (Jan. '26)

Casad, Orla, Supt. of Water Works, Box 624, Merced, Calif. (Nov. '24)

Case, Boyd, Mgr., Edwardsville Water Co., 112 N. Main St., Edwardsville, Ill. (Jan. '39)

Case, E. W., Supt., Newport Water Works, Newport, Ore. (Affil. Jan. '39)

Case, Egbert D., Vice-Pres., The Pitometer Co., 50 Church St., New York, N. Y. (Mar. '21) *Director '33-'35.*

Casper, City of, J. F. Cowan, Mayor, City Hall, Casper, Wyo. (Corp. M. Oct. '37)

Caswell, H. H., *see* Ann Arbor Water Dept.

Cates, Walter H., Salesman, Western Pipe & Steel Co., 153 Sierra View Road, Pasadena, Calif. (Sept. '31)

Catlett, G. F., Chief Engr., State Board of Health, P. O. Box 210, Jacksonville, Fla. (June '16)

Cecil, Lawrence K., Box 1289, Tulsa, Okla. (Jan. '28)

Cedar Rapids City Water Works, H. F. Blomquist, Supt., City Hall, Cedar Rapids, Iowa (Corp. M. Jan. '36)

Ceely, Lyman, *see* Allendale, Water Dept. of Boro of

Center, Geo. F., Supt. of Water Plant, St. Augustine, Fla. (Apr. '40)

Central Foundry Co., The, R. F. Garcia, 386 Fourth Ave., New York, N. Y. (Assoc. M. June '03)

Central Power & Light Co., J. T. Persons, Corpus Christi, Tex. (Corp. M. July '36)

Centriline Corp., H. Seaver Jones, Pres., 140 Cedar St., New York, N. Y. (Assoc. M. Jan. '40)

Chalfant, John C., Supt., Water Works, City Hall, Fort Lauderdale, Fla. (Mar. '31)

Chamberlain, L. H., Mgr., Water Works Sales Section, Crane Co., 836 S. Michigan Ave., Chicago, Ill. (Jan. '24)

Chambers, Grover, Water Supt., Cheney, Wash. (Apr. '38)

Chambers, Henry, Dist. Mgr., A. M. Lockett & Co., 401 Magnolia Bldg., Dallas, Tex. (Oct. '39)

Chamblee, J. V., Supt., Public Utilities, Selma, N. C. (Jan. '36)

Champ, Wm. T., Supt., Village of Sherburne, N. Y. (Jan. '39)

Champa, Ludwig S., Chemist & Bacteriologist, State Board of Health, Helena, Mont. (Jan. '37)

Chapin, Carl K., Secy., Retirement Board, Dept. of Water & Power, Box 3669 Terminal Annex, Los Angeles, Calif. (Oct. '29)

Chapman, F. W., Greenwood, S. C. (Dec. '25)

Chapman Valve Mfg. Co., Donald M. Belcher, 203 Hampshire St., Indian Orchard, Mass. (Assoc. M. Apr. '84)

Chapton, Herbert J., Los Angeles Dept. of Water & Power, 592 South St., Glendale, Calif. (Oct. '37)

Charles, Robert S., Jr., Field Supt., International Water Supply, Ltd., 107 Windsor Ave., London, Ont., Can. (Jan. '36)

Charleston Comrs. of Public Works, 14 George St., Charleston, S. C. (Corp. M. May '12)

Charlton, David B., Bacteriologist, Charlton Labs. Inc., 2340 S. W. Jefferson St., Portland, Ore. (Jan. '38)

Chase Brass & Copper Co., 236 Grand St., Waterbury, Conn. (Assoc. M. Mar. '29)

Chase, Edward S., Cons. Engr., Metcalf & Eddy, Cons. Engrs., 1300 Statler Bldg., Boston, Mass. (May '19)

Chase, George E., Mgr., Public Utilities Com., Bownanville, Ont., Can. (Sept. '33)

Chase, H. W., Supt. of Water Works, Colfax, Wash. (Apr. '39)

Chase, Horace H., Box 252, Sandwich, Mass. (May '24)

Chatham Board of Water Comrs., T. M. S. Kingston, Mgr.-Engr., Chatham, Ont., Can. (Corp. M. Feb. '24)

Chediak, M., Prof. Medical School, San Lazaro #465, Havana, Cuba (Jan. '39)

Chenery, Charles M., Pres., New York Water Service Corp., 90 Broad St., New York, N. Y. (Apr. '40)

Chenery, Christopher T., Pres., Federal Water Service Corp., 90 Broad St., New York, N. Y. (June '26)

Chester, J. N., The Chester Engrs., 210 E. Park Way, N. S., Pittsburgh, Pa. (Nov. '10)

Chevalier, Willard, Vice-Pres., In Charge of Civ. Eng. Publications, McGraw-Hill Publishing Co., 330 W. 42nd St., New York, N. Y.

(June '34) *Goodell Prize '34. Director '38-'40.*

Chiarolla, Frank V., 854 N. Figueroa St., Los Angeles, Calif. (Apr. '39)

Chibas, Eduardo J., Cons. Engr., Calle H. No. 359 Esquira A 17, Vedado, Havana, Cuba (July '38)

Chicago Bridge & Iron Co., George T. Horton, Pres., 1305 W. 105th St., Chicago, Ill. (Assoc. M. June '08)

Chicago Pump Co., L. P. Blattner, 2336 Wolfram St., Chicago, Ill. (Assoc. M. Jan. '40)

Chidaine, Paul, Administrateur-Directeur, Eau et Assainissement, 7, Rue de Teheran, Paris, 8, France (May '30)

Chiene, Walter S., Dist. Mgr., Peoples Water & Gas Co., Marshfield, Ore. (July '35)

Childs, Fred S., 1060 Broad St., Newark, N. J. (May '30)

Chillicothe Water Co., O. P. Tatman, Pres., 36 W. Second St., Chillicothe, Ohio (Corp. M. Oct. '30)

Chilton, Frank R., *see* Pittsburg Munic. Power Co.

Chinn, Keith R., Chemist, Bacteriologist & Chief Engr., West Palm Beach Water Co., P. O. Box 1331, West Palm Beach, Fla. (Feb. '27)

Christensen, C. H., Mgr., Missoula Div., Montana Power Co., Missoula, Mont. (Oct. '19)

Christopher, J. B., Warrensburg P. P.-S. Water Co., Warrensburg, Mo. (July '35)

Chubb, Robert S., Chief Engr., Bureau of Water, 1318 Carbon St., Reading, Pa. (May '30)

Church, James, *see* Green Bay Water Dept.

Chute, W. M., Water Works Supt., Wheatley, Ont., Can. (Apr. '34)

Citizens Utilities Co., F. A. Merfeld, Dist. Mgr., Wallace, Idaho (Corp. M. Apr. '38)

Citizens Water Supply Co. of Newtown, J. Edward Meyer, 83-11 Whitney Ave., Elmhurst, L. I., N. Y. (Corp. M. Jan. '11)

Claflin, Charles R., Supt., Water Co., Rensselaer, N. Y. (Sept. '19)

Claggette, Arthur D., Supt., Water Dept., 585 W. Tuscarawas Ave., Barberton, Ohio (Jan. '40)

Clapp, Milton, Jr., Chemist, 3737 Selwyn Ave., Charlotte, N. C. (Jan. '36)

Clapp, W. J., Commercial Repr., Florida Public Service Co., 100 E. Central Ave., Orlando, Fla. (July '38)

Clark, Dennis H., Supt., West Virginia Water Service Co., Welch, W. Va. (Jan. '39)

Clark, Eugene S., Div. of San. Eng., State Dept. of Public Health, Springfield, Ill. (July '35)

Clark, Everett L., Engr., California Railroad Com., 708 State Bldg., Los Angeles, Calif. (Oct. '39)

Clark, F. W. G., 813 Island Rd., Victoria, B. C., Can. (June '23)

Clark, H. C., Supt., Munic. Water Works, Hillsdale, Mich. (Jan. '38)

Clark, H. W., Co., Box 563, Mattoon, Ill. (Assoc. M. May '08)

Clark, Harry W., 89 Broad St., Boston, Mass. (May '20)

Clark, Horace L., Supt., Sanford Water Dist., Sanford, Me. (Apr. '30)

Clark, Lloyd K., Director, Div. of San. Eng., State Dept. of Health, Bismarck, N. D. (Jan. '39)

Clark, M. S., Salesman, Mathieson Alkali Works, Inc., 1853 E. Beardsley Ave., Elkhart, Ind. (Apr. '37)

Clark, Owen, E., Const. Engr., Div. of Water, 110 Cherry St., Toledo, Ohio (Oct. '38)

Clark, Seymour H., Supt. of Water Dept., 114 Washington Ave., Oneida, N. Y. (Jan. '40)

Clark, Sims C., Supt. of Water Properties, Central Power & Light Co., San Benito, Tex. (Apr. '36)

Clark, William George, Supervising Const. Engr., Div. of Water, 110 Cherry St., Toledo, Ohio (July '08)

Clark, William H., Supt., Water Works, Avon, N. Y. (May '16)

Clarkson, L. M., State Dept. of Public Health, Atlanta, Ga. (Aug. '29)

Classen, Ashley G., *see* El Paso Water Dept.

Classon, W. Guy, Supt. & Registrar, Leominster Water Works, Leominster, Mass. (June '31)

Clay, Joe, Supt., Carlisle Water Works, Carlisle, Ky. (Jan. '24)

Clay, John W., Supt., Water Dept., Room 11, City Hall, 2nd and Main Sts., Alhambra, Calif. (Oct. '37)

Clayton Mfg. Co., E. Fred Franklin, Sales Promotion Mgr., 501 S. Marengo Ave., Alhambra, Calif. (Assoc. M. Oct. '39)

Clayton, Nelson J., Supt., Pottsville Water Co., 221 Centre St., Pottsville, Pa. (Mar. '25)

Clement, Russell C., 6629—32nd St., N. W., Washington, D. C. (July '35)

Cleminson, J. E., 360 So. Tyler, El Monte, Calif. (July '35)

Cleveland, E. A., Chief Comr., Greater Vancouver Water Dist., 1303 Bekins Bldg., Vancouver, B.C., Can. (Mar. '24)

Cleverdon, Walter S. L., Supervisor of Property & Assoc., Prof. of San. Eng., New York Univ., Washington Sq., New York, N. Y. (Apr. '16)

Clifford, U. A., Supt., Light & Water Dept., Cairo, Ga. (Apr. '29)

Cliffs Dow Chemical Co. V. G. Holliday, Marquette, Mich. (Assoc. M. Apr. '38)

Clifton, Charles Elmer, Chemist, Cannon Bldg., Troy, N. Y. (Mar. '10)

Clogher, A. C., *see* Ebasco Services, Inc.

Clot, Henry, Topographical Draftsman, Bureau of Water Works & Supply, 2630 Maceo St., Los Angeles, Calif. (Apr. '38)

Clouser, L. H., San. Engr., Tennessee Valley Authority, 508 Union Bldg., Knoxville, Tenn. (July '37)

Clow, James B., & Sons, Kent S. Clow, 201 N. Talman Ave., Chicago, Ill. (Assoc. M. Apr. '85)

Clyde, Ralph C., *see* Portland Bureau of Water Works

Coale, G. B., *see* National Lead Co.

Coates, John James, % Sheppard T. Powell, Chem. Engr., 330 N. Charles St., Baltimore, Md. (Jan. '38)

Cobleigh, W. M., Dean, School of Eng., State A. & M. College, Bozeman, Mont. (May '33)

Coburn, James W., Treas., Consumers Water Co., Box 151, Pearl St. Station, Portland, Me. (Feb. '23)

Cochrane, John C., 418 Flannery Bldg., Station No. 13, Pittsburgh, Pa. (July '35)

Coe, Glen F., Mgr., Secy. & Treas., Dixon Water Co., 121 E. First St., Dixon, Ill. (May '30)

Coffey, Ray, *see* Hastings Board of Public Works

Coffman, D. G., Water Supt., 1417 Washington St., Sumner, Wash. (Apr. '39)

Colby, A. C., Engr., Hammond Water Dept., 6519 Forest Ave., Hammond, Ind. (Jr. M. Jan. '39)

Cole, A. B., Sr., Supt., Water Dept., Box 826, Midland, Tex. (Oct. '39)

Cole, B. G., Chemist, City Water Dept., Monroe, La. (Oct. '39)

Cole, Chas. W., Cons, Engr., 220 W. La Salle St., South Bend, Ind. (Oct. '38)

Cole, E. Shaw, Engr., The Pitometer Co., 50 Church St., New York, N. Y. (Oct. '38)

Cole, Edward S., Pres., The Pitometer Co., 50 Church St., New York, N. Y. (June '02)

Cole, Marvin, Supt. of Water Works, 1405 Otley Ave., Perry, Iowa (Apr. '36)

Cole, Thomas A., Bacteriologist & Supt. of Filtration, 172 Mansion Square, Poughkeepsie, N. Y. (Jan. '35)

Collar, Ira T., Jr., Dist. Mgr., Neptune Meter Co., 2107 Grand Ave., Kansas City, Mo. (Oct. '38)

Collier, F. E., Supt., Munic. Water Works, 253 Broad St., Cookeville, Tenn. (Apr. '26)

Collings, William E., Supt., Borough of Collingswood, 713 Lees Ave., Collingswood, N. J. (Oct. '38)

Collins, C. E., Supt. Public Utilities, Kilgore, Tex. (Oct. '39)

Collins, N. R., Chief Chemist, Marine Chemicals Co., Ltd., South San Francisco, Calif. (Jan. '39)

Collins, Thomas E., Chief Engr., Water Dept., City Hall, Elizabeth, N. J. (July '36)

Collins, W. D., Chemist, U. S. Geological Survey, Washington, D. C. (Dec. '25)

Collins, W. F., 29 Montrose Rd., Scarsdale, N. Y. (Jr. M. Jan. '40)

Collyer, William I., *see* White Plains Dept. of Public Works

Columbia, J. Z., Chemist, Filter Plant, Langeloth Water Co., R. D. #3, Burgettstown, Pa. (Apr. '40)

Columbia Alkali Corp., The, A. E. Boss, Technical Service Dept., Barberton, Ohio (Assoc. M. Jan. '39)

Colyer, James F. C., Salesman, Fairbanks Morse & Co., P. O. Box 660, Winter Haven, Fla. (Apr. '40)

Community Water Service Co., Geo. W. Biggs, Jr., Pres., 50 Broad St., New York, N. Y. (Corp. M. Jan. '27)

Compton, Harold E. T., Chief Engr., United Filters & Eng., Ltd., "Pertenhall", Mayfield Ave., Orpington, Kent, England (Jan. '39)

Comstock, C. D., Supt., Sodus Point Water Works, Sodus Point, N. Y. (Apr. '39)

Conard, William R. Engr. & Consultant, 321 High St., Burlington, N. J. (June '04)

Conger, Charles O., *see* Poughkeepsie Board of Public Works

Conk, Robert H., Chemist & Bacteriologist, West Palm Beach Water Co., 416 Biscayne Drive, West Palm Beach, Fla. (Apr. '31)

Conkling, Harold, Deputy State Engr., State Div. of Water Research, Box 1079, Sacramento, Calif. (Oct. '39)

Conlan, James F., 160 Nelson Rd., Scarsdale, N. Y. (Apr. '34)

Connell, C. H., Route 4, 2211 S. College Ave., Bryan, Tex. (Jan. '38)

Connell, H. P., Secy.-Treas. & Gen. Mgr., Baton Rouge Water Works Co., P. O. Box 626, Baton Rouge, La. (Jan. '39)

Connell, William B., Pres., Chem. Eng. Labs., 2800 Logan St., Dallas, Tex. (Aug. '30)

Connolly, Joel I., Asst. to Pres., Board of Health, Chicago, Ill. (June '30)

Connor, C. M., Technical Director, Valley Forge Labs., Inc., Balligomingo Rd., West Conshohocken, Pa. (Jan. '38)

Connor, F. J., 221 N. Spring Ave., Sioux Falls, S. D. (May '00)

Conradi, L. C., Technical Research Director, International Business Machines Corp., Endicott, N. Y. (Jan. '39)

Conroy, Walter C., Office Mgr., Water Dept., 99 Watson Rd., Belmont, Mass. (Jan. '37)

Consoer, Arthur Wardell, Consoer-Townsend & Quinlan, 211 W. Wacker Drive, Chicago, Ill. (July '39)

Consolidated Chemical Industries, Inc., A. P. Jones, Box 1932, Fort Worth, Tex. (Assoc. M. July '35)

Contant, T. D., 2540 N. W. 13th St., Oklahoma City, Okla. (Oct. '39)

Conwell, John W., Jr. Engr., Tide Water Assn. Oil Co., Bayonne, N. J. (Jr. M. Jan. '40)

Cook, A. D., Inc., C. O'Brien, Pres., Lawrenceburg, Ind. (Assoc. M. June '14)

Cook, A. T., Civ. Engr., 718 W. Fourth St., Lawrence, Kan. (Dec. '28)

Cook, Frederick S., Pacific Coast Mgr., Robert W. Hunt Co., 251 Kearny St., San Francisco, Calif. (Oct. '37)

Cook, H. M., Supt., City Pumping Station, Batavia, N. Y. (Apr. '37)

Cook, Horace J., 268 Court St., Auburn, Me. (July '35)

Cook, James R., P. O. Box 1082, Raleigh, N. C. (Jan. '37)

Cook, John H., Governor, Society for Establishing Useful Manufactures, 72 McBride Ave., Paterson, N. J. (July '06)

Cook, Loy E., Supt., Madera Water Works, 220 S. First, Madera, Calif. (Oct. '39)

Cook, Paul D., Lake County San. Engr., Court House, Painesville, Ohio (Mar. '34)

Cook, Will W., Advisory Engr., 546 N. 79th St., Seattle, Wash. (Apr. '38)

Cook, William J. M., Chief Chemist, Neckar Water Softener Co., Ltd., Artillery House, Artillery Row, London, S.W. 1, England (June '34)

Cooper, J. E., In Charge of Water Treatment, Medical Dept., Ford Motor Co., Dearborn, Mich. (July '40)

Cooper, M. B., Supt., Canal & Water Works, Augusta, Ga. (May '33)

Coote, Richard, Chemist, Dept. of Water Works, 321 Franklin St., Michigan City, Ind. (Oct. '39)

Copeland, Ross A., Supt., Pipe Construction, Los Angeles Dept. of Water & Power, 6676 Franklin Ave., Los Angeles, Calif. (Oct. '30)

Copper & Brass Research Assn., Carter S. Cole, Engr., 420 Lexington Ave., New York, N. Y. (Assoc. M. Aug. '23)

Corbett, G. A., Secy.-Treas., Geraldton Lands, Ltd., 67 Yonge St., Toronto, Ont., Can. (Jan. '40)

Cordt, Hugh A., Salesman, Rensselaer Valve Co., 3534 Portland Ave., Minneapolis, Minn. (Apr. '39)

Corey, R. H., Cons. Engr., 909 Bedell Bldg., Portland, Ore. (June '20)

Corin, Magnus F., Chemist, 511 Hansberry St., Germantown, Philadelphia, Pa. (Apr. '10)

Corine, George A., Supt., Water & Gas Dept., Superior Water, Light & Power Co., Superior, Wis. (Oct. '24)

Cornejo, Antonio, Chief Engr., Mexico City Water Works, Augustin V. Eguia 19, Tacubaya, D. F., Mexico (Jan. '36)

Cornelison, Wm. R., Chief Clerk, Water Dept., City Hall, Perth Amboy, N. J. (Jan. '37)

Cornelius, Clarence C., Supt. of Public Works, 706 Philadelphia Blvd., Sea Girt, N. J. (Oct. '39)

Cornell, Chas. Brown, Const. Engr., R. D. Middle River, Md. (May '28)

Cornell, E. F., *see* Hawaiian Pineapple Co., Ltd.

Cornell, Guy B., Fresno City Water Dept. Engr., P. O. Box 1274, 1926 Tuolumne St., Fresno, Calif. (Oct. '38)

Cornell, W. M., Mgr., Public Utilities Com., 741 Queen St., E., Sault Ste. Marie, Ont., Can. (Jan. '37)

Corpus Christi, City of, J. C. Bisset, City Engr., Eng. Dept., City Hall, Corpus Christi, Tex. (Corp. M. Apr. '39)

Cortese, J. R., Supt., Water Works, 411 S. Second St., Livingston, Mont. (Mar. '25)

Cosculluela, Juan A., Cons. Engr., Calle Linea Numero 72, Altos, Havana, Cuba (Oct. '13)

Costello, James W., Chief Engr., Dept. of Public Affairs, City Hall, Newark, N. J. (Oct. '38)

Cottingham, C. R., Auditor, Independence Waterworks Co., 206 N. Liberty St., Independence, Mo. (Jan. '37)

Cotton, James E., Director, Florida Construction Program, Tallahassee, Fla. (July '40)

Coughlan, R. E., Engr. of Tests, Chicago & N. Western Ry. System, 4200 W. Kinzie St., Chicago, Ill. (Feb. '23)

Coughlen, Harry G., Jr., Asst. Supt. of Pumping, Indianapolis Water Co., 113 Monument Circle, Indianapolis, Ind. (Jan. '37)

Coughlin, L. J., 563—16th St., San Bernardino, Calif. (Oct. '38)

Coulter, C. B., Mgr., Texas Public Service Co., McCamey, Tex. (Oct. '39)

Coupal, Roy E., City Bacteriologist, Water Dept., P. O. Box 606, Eureka, Calif. (Jan. '40)

Courtney, John W., Salesman, Electro Refractories & Alloys Corp., 23734 Sterling Ave., Dearborn, Mich. (Oct. '39)

Cousins, J. E., Jr., Southern Repr., Layne Atlantic Co., P. O. Box 2431, Orlando, Fla. (July '38)

Coventry, F. L., Chemist & Chief Operator, Water Dept., 12th & Marshall Sts., Mattoon, Ill. (July '39)

Cowan, J. F., *see* Casper, City of

Cowham, Glenn W., 123 W. 5th St., Montgomery, Ala. (Jan. '38)

Cowles, M. Warren, Health Officer, Hackensack Water Co., Filtration Plant, New Milford, N. J. (Apr. '19)

Cox, Charles R., Chief, Bureau of Water Supply, Div. of Sanitation, State Dept. of Health, Albany, N. Y. (July '21) *Fuller Award '40.*

Cox, W. Jeff, *see* Crown Point Water Dept., City of

Coy, Burgis G., *see* Fort Collins, City of

Crabbe, B. F., McWane Cast Iron Pipe Co., Birmingham, Ala. (July '35)

Crabill, E. F., Supt., Board of Public Works, City Hall, Niles, Mich. (Apr. '38)

Crafton, Logan, Supt., City Water Works, City Hall, Bloomington, Ind. (Jan. '40)

Craig, Charles, Supt., Holloway Water Works, Holloway, Ohio (Affil. Apr. '40)

Craig, Robert H., Cons. Engr., 222 N. Third St., Harrisburg, Pa. (May '19)

Cramer, Clark J., Chief Engr., Lexington Water Co., Richmond Pike, R. F. D. No. 1, Lexington, Ky. (July '30)

Cramer, H. Cable, Mgr., Catlettsburg, Kenova & Ceredo Water Co., Inc., 2511 Broadway, Catlettsburg, Ky. (Jan. '40)

Cranch, Eugene T., Mgr., New Rochelle Water Co., 304 Eastchester Rd., New Rochelle, N. Y. (Mar. '22)

Crane Co., A. M. Houser, Engr. of Standardization, 836 S. Michigan Ave., Chicago, Ill. (Assoc. M. Jan. '26)

Crane, D. Eugene, 541 Santa Fe Drive, Denver, Colo. (Jr. M. Jan. '39)

Crane, D. W., Chemist, Chesapeake & Ohio Ry. Co., Columbus, Ohio (Jan. '37)

Crane, Harold L., Supt., Elizabethtown Water Co., Consolidated, 9 Wilson Terrace, Elizabeth, N. J. (Oct. '35)

Cranford, W. H., Supt. of Water Plant, Rock Hill Printing & Finishing Co., Rock Hill, S. C. (Jan. '39)

Cranston, H. Howard, Repr., Layne-New York Co., 310 W. Main St., Fredonia, N. Y. (Jan. '40)

Crawford, William D., Jr., 410 Park Rd., Ambridge, Pa. (Apr. '39)

Crawford, William H., Engr., Pennsylvania Water Service Co., 5013 N. Sydenham St., Philadelphia, Pa. (Jan. '36)

Creager, William P., Cons. Engr., Electric Bldg., Buffalo, N. Y. (July '39)

Crist, Howard, *see* Richfield Springs Water Com.

Crist, Marion L., Engr., Little Rock Munic. Water Works, Capitol & Broadway, Little Rock, Ark. (Feb. '33)

Critchlow, H. T., Div. Engr., N. J. State Water Policy Com., Trenton Trust Company Bldg., Trenton, N. J. (Feb. '30)

Crocker, J. R., Dist. Mgr., The Permutit Co., 523 B. M. A. Bldgs., Kansas City, Mo. (July '38)

Crockett, C. L., Chemist, Norfolk & Western Ry., Roanoke, Va. (Jan. '35)

Croft, Harry P., 208 Maple Ave., Trenton, N. J. (Jan. '24)

Croll, David, *see* Windsor Utilities Com.

Croll, Emil A., 639 Putnam St., Orlando, Fla. (Sept. '93)

Cronkright, Arthur B., San. Engr., Greenwich Water Co., Greenwich, Conn. (Jan. '37)

Cropsey, W. H., Supt., Water Dept., City Hall, St. Paul, Minn. (Apr. '40)

Crosby, Lothrop, Asst. Engr., Water Div., 402 City Hall, Tacoma, Wash. (Jan. '36)

Cross, Arthur D., *see* Mount Holly Water Co.

Cross, William P., Assoc. Hydr. Engr., U. S. Geological Survey, P. O. Box 2529, 1710 Courthouse, Miami, Fla. (Jan. '40)

Crossman, A. B., Dist. Sales Mgr., National Meter Co., Dallas, Tex. (Oct. '39)

Crow, A. V., Supt., Plymouth Water Dept., 212 Pierce St., Plymouth, Ind. (Oct. '39)

Crow, Frank G., Gen. Mgr., Water Dept., Florence, Ala. (July '35)

Crown Point, City of, Water Dept., W. Jeff Cox, Supt., Crown Point, Ind. (Corp. M. Jan. '38)

Crum, E. H., Sales Repr., Mississippi Lime Co., Alton, Ill. (Oct. '39)

Cuba, Cia de Acueducto de Cuba, S. A., Carlos M. Calvert, Vice-Pres., Gral. Lee 27, Manianao, Havana, Cuba (Corp. M. June '39)

Cullen, Bernard W., Supt., Water Pipe Extension, 404 City Hall, Chicago, Ill. (May '34)

Culler, Paul D., Supt. of Water Dept., Cocoa, Fla. (July '38)

Culligan Zeolite Company, E. J. Culligan, 1895 Shermer Ave., Northbrook, Ill. (Assoc. M. Apr. '38)

Cullman City Light & Water Plant, J. N. Nix, Chief Engr., Cullman, Ala. (Corp. M. July '35)

Cullum, George P., W. G. Cullum Co., 502 National Life Bldg., Dallas, Tex. (Oct. '39)

Culter, L. W., Supervising Refrig. Engr., Florida Power & Light, Miami, Fla. (Apr. '34)

Cunliffe, Russell W., Health Dept., City Hall, Milwaukee, Wis. (Dec. '26)

Cunningham, A. H., Dist. Mgr., Atlas Powder Co., 411 W. 5th St., Los Angeles, Calif. (Jan. '37)

Cunningham, F. G., Fairfield Woods Rd., Fairfield, Conn. (Apr. '23) *Director '31–'35.*

Cunningham, John W., Supt., Water Dept., Corpus Christi, Tex. (July '30)

Cunningham, John Wilbur, Cons. Engr., 414 Spalding Bldg., Portland, Ore. (May '29)

Cunningham, M. B., Supt. & Engr., Oklahoma City Water Dept., Oklahoma City, Okla. (Oct. '30)

Currens, Warren W., Chief Chemist, Passaic Valley Water Com., Box 268, Little Falls, N. J. (Jan. '39)

Currie, Frank S., Mgr., Currie Eng. Co., 219 Anderson Bldg., San Bernardino, Calif. (Apr. '36)

Curtis, Wm. E., Mgr., Belmont County Water Dist., Belmont, Calif. (July '35)

Cuthiell, C., Supt. of Water Works, Dickson St., Galt, Ont., Can. (Apr. '29)

Cutler-Hammer Inc., C. S. Pinkerton, Mgr., Public Works & Utilities Sales, 12th St. & St. Paul Ave., Milwaukee, Wis. (Assoc. M. Jan. '36)

Cyr, Rene, Asst. Chief San. Engr., Div. of San. Eng., Ministry of Health, 89 Notre Dame St., E., Montreal, Que., Can. (Jan. '34)

Dafoe, A. L., Supt., Water Works Dept., Napanee Public Utilities Com., Napanee, Ont., Can. (Feb. '32)

Dagley, Jack, Sales Director, Burgess Zeolite Co., Ltd., 72 Horseferry Rd., London, S. W. 1, England (Apr. '38)

Dahle, C. A., Supt., Stoughton Water Works, Stoughton, Wis. (July '35)

Dahljelm, Irving L., 103 North Ave., Highland Park, Mich. (Jan. '38)

Dahm, Henry L., G. S. Robins & Co., 316-320 S. Commercial St., St. Louis, Mo. (July '35)

Dale, H. B., Chemist, Chesapeake & Ohio Ry. Co., 407 C. & O. Station Annex, Huntington, W. Va. (July '37)

Dalee, William A., Pres., Wm. A Dalee, Inc., 4835 Woodward Ave., Detroit, Mich. (July '38)

Dallach, W. A., Water Works Dept., Crane Co., 836 S. Michigan Ave., Chicago, Ill. (July '35)

Dallyn, F. A., Cons. Engr., Whiteside P. O., Ont., Can. (Jan. '40)

Dandridge, E. F., Chief Clerk, Bureau of Water Works & Supply, Box 3669 Terminal Annex, Los Angeles, Calif. (Oct. '34)

Dangler, J. R., Cast Iron Pressure Pipe Institute, Earle Bldg., Room 1006, Washington, D. C. (Apr. '31)

Daniel, Laurence Handy, Mgr., Daniel, Inc., Metropolitana Bldg. 814-815, Havana, Cuba (Apr. '39)

Daniels, Francis E., State Dept. of Health, Eng. Div., 2115 N. Second St., Harrisburg, Pa. (Sept. '16)

Daniels, Paul I., Land Agent, East Bay Munic. Utility Dist., 512—16th St., Oakland, Calif. (May '33)

Daniels, Percy, Supt., Water Dept., Perry, Okla. (Oct. '39)

Danner, H. M., Dist. Sales Mgr., The Permutit Co., 522 Union Bldg., 1836 Euclid Ave., Cleveland, Ohio (July '37)

Darby, George M., Director, Westport Mill, The Dorr Co., 61 Washington Ave., Westport, Conn. (Apr. '36)

Darco Corp., L. M. Gill, 60 E. 42nd St., New York, N. Y. (Assoc. M. Jan. '36)

Dark, Watson A., Scranton-Spring Brook Water Service Co., 135 Jefferson Ave., Scranton, Pa. (May '29)

Darling, Ernest Howard, Cons. Engr., 21 Stanley Ave., Hamilton, Ont., Can. (Dec. '25)

Darling, K. E., Gen. Mgr., Southern Wyoming Utilities, Rock Springs, Wyo. (Oct. '37)

Darling Valve & Mfg. Co., M. L. Hough, Vice-Pres., Williamsport, Pa. (Assoc. M. May '08)

Darrow, Henry D., Supt., Water Works Dept., 408 Broadway, Kingston, N. Y. (Jan. '36)

Daugherty, Frank, Pres., Scofield Eng. Co., 1324 Commercial Trust Bldg., Philadelphia, Pa. (Mar. '31)

Davenport, J. D., Pres. & Treas., Sturgis Waterworks Co., Sturgis, S. D. (July '35)

Davidson, Chas. Mason, Asst. San. Engr., State Board of Health, 2325 Glenmary Ave., Louisville, Ky. (Apr. '39)

Davidson, Frederick R., *see* Hicksville Water Dist.

Davidson, George M., Ind. Engr., Chicago & N. Western Ry. Co., 211 N. East Ave., Oak Park, Ill. (Mar. '15)

Davidson, J. O., Chemist, Water Dept., 820 Beatties Ford Rd., Charlotte, N. C. (Oct. '39)

Davies, W. F., Supt., Gloversville Water Works, 19 W. Fulton St., Gloversville, N. Y. (Feb. '32)

Davis, Albert R., Supt., Water Dept., Austin, Tex. (Jan. '35)

Davis, Ben G., Supt., Pipe Line, Rawlins Water Supply Co., Rawlins, Wyo. (July '35)

Davis, Carleton E., Mgr., Philadelphia Suburban Water Co., 762 Lancaster Ave., Bryn Mawr, Pa. (Apr. '12) *Trustee '16–'18. Vice-Pres. '19. President '20. Exec. Com. '21–'22. Honorary M. '39.*

Davis, Daniel E., The Chester Engrs., Century Bldg., 130 Seventh St., Pittsburgh, Pa. (May '30)

Davis, E. I., Comr. of Public Utilities, Dept. of Water & Sewerage, City Hall, Shreveport, La. (Jan. '39)

Davis, H. F., Dist. Mgr., Wallace & Tiernan Co., Inc., 1902 Pinewood Circle, Charlotte, N. C. (Dec. '23)

Davis, Kenneth, *see* North Creek Water Dist.

Davis, M. D., Supt., Water Dept., Dillon, S. C. (July '39)

Davis, P. D., Assoc., Wm. M. Piatt Const. & Eng., Durham, N. C. (Oct. '39)

Davis, S. H., Supt., Benwood & McMechen Water Co., 4820 Water St., Benwood, W. Va. (Mar. '34)

Davis, Walter S., 686 Myrtle Ave., Albany, N. Y. (May '33)

Daw, Lawrence, Mgr., New York Fire Insurance Rating Organization, 400 E. Genesee St., Syracuse, N. Y. (May '16)

Dawes, E. A., Dawes Silica Mining Co., Thomasville, Ga. (Feb. '33)

Dawson, F. M., Dean, College of Eng., Univ. of Iowa, Iowa City, Iowa (Oct. '28)

Day, Isaac L., Comr. of Public Works, 4 Wheeler Ave., Pleasantville, N. Y. (Apr. '38)

Dean, John B., Water Comr., 312 City Hall, St. Louis, Mo. (Apr. '30)

DeBerard, W. W., *Engineering News-Record,* 520 N. Michigan Ave., Chicago, Ill. (June '12)

De Boer, Sidney, Filter Plant Operator, 15 Moross Rd., Village of Grosse Pointe Farms, Mich. (Apr. '39)

Decker, A. Clinton, San. Engr., Tennessee Coal, Iron & R.R. Co., Birmingham, Ala. (June '14)

Decker, Arthur J., Cons. Civ. Engr., 2014 Geddes Ave., Ann Arbor, Mich. (May '23)

Decker, Charles Garfield, Instructor, Civil Eng. Dept., Texas Technological College, Lubbock, Tex. (Jan. '40)

Decker, Fred, *see* Maybrook Water Board

de Costa, Joseph D., San. Engr., East Bay Munic. Utility Dist., 512—16th St., Oakland, Calif. (Sept. '23)

de Goicoechea, Leandro, Asst. Prof., Escuela de Ingenieros, Universidad de la Habana, Havana, Cuba (July '38)

De Groot, J. C., Supt., Clear Springs Water Service Co., 2019 Main St., Northampton, Pa. (Jan. '31)

De Jarnette, N. M., Chemist, State Board of Health Lab., Atlanta, Ga. (Mar. '30)

De Laval Steam Turbine Co., H. V. Petersen, Sales Mgr., Trenton, N. J. (Assoc. M. Nov. '17)

Delavan Water Com., Chas. S. Moses, Supt., Delavan, Wis. (Corp. M. June '23)

De Leon, Gregorio, *see* Manila Metropolitan Water Dist.

De Leuw, Charles E., Charles De Leuw & Co., Engrs., 20 N. Wacker Drive, Chicago, Ill. (Nov. '23)

Deliso, Joseph, Pres., Mountain View Water Works, Inc., Mountain View, N. J. (Jan. '39)

Dellone, Fred, Jr., Pres., Dellone Construction Co., Thomas Bldg., 1316 Wood St., Dallas, Tex. (Apr. '40)

Delphi Water Works, Curtis McCain, Water Agent, Delphi, Ind. (Corp. M. Apr. '40)

De Martini, Frank Edward, San. Engr., U. S. Public Health Service, 3rd & Kilgour Sts., Cincinnati, Ohio (Sept. '27)

Deming Water Dept., A. J. Noyes, Deming, N. M. (Corp. M. May '19)

Dempster, Andrew, Asst. San. Engr., Detroit Dept. of Health, 3919 John R. St., Detroit, Mich. (Oct. '39)

de Narvaez, Pablo, Asst. Supt., Acueducto Municipal, Box # 204, Bogota, Colombia, S. A. (Jan. '40)

Dennett, Robert C., Hydr. Engr., National Board of Fire Underwriters, 85 John St., New York, N. Y. (May '14)

Dent, John W., City Mgr., Cartersville, Ga. (Apr. '39)

Dent, Wilbur M., Gen. Mgr., City Power & Water Dept., Sheffield, Ala. (Jan. '40)

Denton, Frank, Supt. of Water Works, Salem, Ill. (Aug. '33)

Denver, City & County of, Board of Water Comrs., George F. Hughes, Mgr., P. O. Box 629, Denver, Colo. (Corp. M. Apr. '34)

Deo, R. R., Chief Chemist, Paterson Eng. Co.—India—Ltd., P. O. Box 680, Calcutta, India (Oct. '38)

Derby, Ray L., Asst. San. Engr., Dept. of Water & Power, Box 3669 Terminal Annex, Los Angeles, Calif. (May '26)

de Santamaria, Carlos S., San. & Civ. Engr., Apartado No. 409, Bogota, Colombia, S. A. (Jan. '35)

Des Baillets, C. J., Chief Engr., Montreal Water Board, 3161 Joseph St., Verdun, Que., Can. (Mar. '34)

Deseronto Public Utilities Com., S. C. Hughes, Supt., Water Dept., Deseronto, Ont., Can. (Corp. M. Jan. '37)

Deslauriers, Alfred J., Civ. Engr., City Hall, #1—18th Ave., Lachine, Que., Can. (Dec. '33)

Des Moines Water Works, Dale L. Maffitt, Secy. & Gen. Mgr., Des Moines, Iowa (Corp. M. Jan. '36)

Detweiler, John C., Const. Engr., Metropolitan Utilities Dist., Omaha, Neb. (Mar. '30)

Devendorf, Earl, Assoc. Director, Div. of Sanitation, State Health Dept., 1228 State St., Schenectady, N. Y. (May '19)

Devilbiss, H. Roland, Dept. Engr., Washington Suburban Sanitary Dist., Hyattsville, Md. (Apr. '22)

De Waissey, L. L., Mgr., Northwest Testing Lab., Hartford Bldg., 2nd & James Sts., Seattle, Wash. (Apr. '40)

Dewey, Hugh S., Mgr., Western New York Water Co., 11 Niagara St., Buffalo, N. Y. (May '29)

De Wolf, Anson B., Mech. Engr., 1255 N. W. 32nd St., Miami, Fla. (Jan. '40)

Diamond Alkali Co., J. D. Mattern, Asst. Mgr. of Sales, 436 Seventh Avé., Pittsburgh, Pa. (Assoc. M. Apr. '37)

Dickson, D. B., Supt. & Chemist, Filtration Plant, Wichita Falls Water Works, Wichita Falls, Texas (Jan. '39)

Dickson, W. K., Civ. Engr., 119 Circle Ave., Charlotte, N. C. (Apr. '38)

Diederich, Peter, *see* Glendale Public Service Dept.

Diemer, Robert B., Dist. Engr., Metropolitan Water Dist., 306 W. 3rd St., Los Angeles, Calif. (Oct. '37)

Dieter, G. H., *see* Southern California Gas Co.

Dignan, B. T., Chemist & Bacteriologist, City Water Works, Niagara Falls, N. Y. (Apr. '19)

Dill, Howard A., 1807 Reeveston Rd., Richmond, Ind. (May '00) *Exec. Com. '06-'10. Director '38-'40. Fuller Award '39.*

Dill, W. N., Mgr., Mueller Co., Pacific Coast Factory, 2801 E. 12th St., Los Angeles, Calif. (July '38)

Dillon, G. M., Supt. of Public Works, Borough of Braddock, Pa., 727 Braddock Ave., Braddock, Pa. (Apr. '38)

Dillon, James J., Sanitarian, Southern Health Unit, 301 Oxford St., Providence, R. I. (July '38)

Dillon, Richard, Registrar, Water Bureau, Metropolitan Dist. Com., Municipal Bldg., Hartford, Conn. (Aug. '29)

Dillon, S. E., Local Mgr., California Water Service Co., Box 1148, Bakersfield, Calif. (May '27)

Dilworth, H. M., Engr., Township of Etobicoke, Islington, Ont., Can. (Jan. '38)

Dimick, Arthur E., Asst. Secy., Appleton Water Com., 125 N. Walnut St., Appleton, Wis. (Apr. '29)

Dimmitt, C. L., Mgr., Redwood City Water Dept., Redwood City, Calif. (July '39)

District of Columbia Water Dept., J. B. Gordon, Director of San. Eng., Municipal Bldg., Washington, D. C. (Corp. M. Apr. '31)

Ditchburn, A. E., *see* Strathroy Public Utilities Com.

Diven, John M., Leadite Co., Inc., 3445—84th St., Jackson Heights, L. I., N. Y. (June '13)

Diven, Melvin H., Secy., Mt. Union Boro Water Works, Box 606, Mt. Union, Pa. (July '35)

Divine, Leslie T., Water Plant Operator, Monticello, N. Y. (Jan. '36)

Dixie Lime Products Co., T. F. Sheridan, Ocala, Fla. (Assoc. M. Apr. '37)

Dixon, G. Gale, 317 Telegraph Bldg., Harrisburg, Pa. (June '20)

Dixon, Jas. I., Supt. Water Dept., 401 Benton St., Santa Clara, Calif. (May '26)

Dixon, R. M., San. Engr., P. O. Box 2701, Dallas, Tex. (Apr. '38)

Doane, Norman D., 831 E. Morehead St., Charlotte, N. C. (Sept. '31)

Dobbin, R. L., Gen. Mgr., Peterborough Utilities Com., 295 Reid St., Peterborough, Ont., Can. (Feb. '23) *Trustee '26-'28. Diven Medal '30. President '32. Director '33. Honorary M. '37.*

Docal, Antonio T., Civ. Engr., Calle 14, No. 353 Vedado, Havana, Cuba (July '38)

Dodd, Chas. K., 208 Commercial & Professional Court Bldg., Sarasota, Fla. (Jan. '36)

Dodd, Rennie I., Chester Water Service Co., Box 67, Chester, Pa. (Apr. '22)

Dodge, Fred L., Gen. Supt., California Water Service Co., P. O. Box 1150, San Jose, Calif. (July '26)

Dodson, Roy M., Jr., Asst. San. Engr., Oregon State Board of Health, 816 Oregon Bldg., Portland, Ore. (July '39)

Doggett, F. G., *see* Mount Airy City Water Dept.

Doig, Albert Watson, Sales Repr., Johnson Sales Co., 4760 Dagenais St., St. Henry, Montreal, Que., Can. (Apr. '39)

Doll, Byron E., Jr., Civ. Engr., Bureau of Water Works & Supply, 4017 Rosewood Ave., Los Angeles, Calif. (July '39)

Domogalla, Bernhard, Chemist, University Club, 803 State St., Madison, Wis. (Feb. '26)

Donaldson, Edgar F., Chief Engr., Water Works, R. D. No. 1, Defense Highway, Annapolis, Md. (Feb. '32)

Donaldson Iron Co., Emaus, Lehigh County, Pa. (Assoc. M. Nov. '17)

Donaldson, Wellington, Director, Bureau of Sewage Disposal, Dept. of Public Works, 125 Worth St., New York, N. Y. (Apr. '10)

Donnan, William C., Div. Supt., Bureau of Water, 412 City-County Bldg., Pittsburgh, Pa. (Apr. '30)

Donohue, E. R., *see* Balliston Spa Water Dept.

Donohue, Jerry, Pres., Donohue Engineering Co., Sheboygan, Wis. (June '22)

Dorion, Otto Roberto, *see* Guatemala City Cia del Agua del Mariscal, S. A.

Dorion, Robert, City Mgr., Shawinigan Falls, Que., Can. (Jan. '36)

Dorland, F. M., Supt., Water Dept., 41 Beech St., Berea, Ohio (Jan. '39)

Dorr Co., Inc., The, 570 Lexington Ave., New York, N. Y. (Assoc. M. June '27)

Dorrance, Frank Young, Div. Engr., Montreal Water Board, 341 Brock Ave., No., Montreal, West, P.Q., Can. (July '20)

Dorrance, James Aird, 106 Scarborough Drive, Syracuse, N. Y. (Apr. '39)

Dotterweich, A. J., Dist. Sales Engr., The Permutit Co., 615 Dollar Savings & Trust Bldg., Pittsburgh, Pa. (July '38)

Dougherty, Ben. R., Supt., Richmond Water & Light Co., Richmond, Ky. (Apr. '24)

Dougherty, D. J., Supt., Talladega Light & Water Com., Talladega, Ala. (May '25)

Dougherty, Edward R., Supt., Water & Sewerage, City Water Dept., Bowling Green, Mo. (Affil. Jan. '40)

Dover Water Comrs., Earl C. Nelson, Clerk, Municipal Bldg., Dover, N. J. (Corp. M. May '18)

Dow, Douglas, Detroit Edison Co., 2000 Second Ave , Detroit, Mich. (July '38)

Downer, William J., Asst. San. Engr., State Dept. of Public Health, Springfield, Ill. (Jan. '36)

Downs, G. H., Mgr., Crane Co., 30th St. & 1st Ave., S., Billings, Mont. (Jan. '40)

Doyle, Victor H., Dist. Mgr., Pacific States Cast Iron Pipe Co., Rialto Bldg., San Francisco, Calif. (Oct. '39)

Drake, A. D., 207 Lancaster Ave., Buffalo, N. Y. (Jan. '34)

Drake, Chester F., Supt. of Filtration, 226 Delafield Ave., Aspinwall, Pa. (Apr. '10)

Drake, William O., Cons. Engr., 35 E. 4th St., Corning, N. Y. (Apr. '17)

Draves, Harry J., Supt., 321 Franklin St., Michigan City, Ind. (Jan. '38)

Drennan, J. W., Secy.-Treas., Streetsville Public Utilities Com., Streetsville, Ont., Can. (Apr. '40)

Dresser Manufacturing Co., H. P. Boncher, Sales Mgr., Bradford, Pa. (Assoc. M. June '04)

Driftmier, Mark E., Citizens Water Co., 314 N. Fourth St., Burlington, Iowa (July '37)

Driggs, Edwin L., Office Engr., East Bay Munic. Utility Dist., 512—16th St., Oakland, Calif. (May '33)

Driscoll, Florence E., Water Registrar & Secy., Haverhill Water Dept., 14 Court St., Haverhill, Mass. (July '37)

Driskell, Thos. E., Chemist, Water Dept., 1005 Race St., Troy, Ohio (Affil. Jan. '39)

Drost, W. P., Water Supt., 1015 Bond St., Bend, Ore. (July '35)

Druar, John F., Cons. Engr., 1411 Pioneer Bldg., St. Paul, Minn. (Nov. '19)

Du Bois Bureau of Water, M. E. Milliren, City Engr., City Hall, Du Bois, Pa. (Corp. M. Oct. '39)

Dubois, F. W., Pres., F. W. Dubois Co., 2832 E. Grand Blvd., Detroit, Mich. (Jan. '38)

Duckett, Roy, Supt., Water Dept., Sweetwater, Tex. (Oct. '39)

Duckworth, Leon S., Filter Plant Supt., R. D. No. 5, Lancaster, Pa. (Jan. '37)

Duff, Robert A., *see* Medford Water Com.

Duffy, William B., Supt., Public Works, North Andover, Mass. (July '35)

Dufresne, Paul Edmond, City Engr., P. B. 203, Trois-Rivieres, P. Q., Can. (July '38)

Dugan, F. C., *see* Kentucky State Board of Health

Dugger, Eugene F., Gen. Mgr., Newport News Waterworks Com., Newport News, Va. (May '24) *Director '35–'37, '39. President '38.*

Duhme, Ralph E., Asst. Supt., Water Works Supply Div., 5932 Pandora Ave., Pleasant Ridge, Cincinnati, Ohio (Oct. '38)

Dunbar, Chas. A., City Engr., & Supt. of Water Works, Valdosta, Ga. (Apr. '38)

Duncan, D. L., Dist. Mgr., California Water Service Co., P. O. Box 269, Martinez, Calif. (Aug. '30)

Duncan, James, Munic. Engr., Corp. of Dist. of West Vancouver, 1383 Duchess Ave., Hollyburn P. O., West Vancouver, B. C., Can. (Jan. '39)

Dunham, Henry G., Bacteriologist, 920 Henry St., Detroit, Mich. (June '25)

Dunham, Stanley, 1608 Malcolm Ave., Los Angeles, Calif. (Oct. '34)

Dunkirk Board of Water Comrs., W. O. Peck, Supt., City Hall, Dunkirk, N. Y. (Corp. M. Apr. '37)

Dunlap Co., The, Homer Dunlap, Pres., Oklahoma City, Okla. (Assoc. M. July '38)

Dunmire, E. H., Cons. Engr., 2774 South St., Lincoln, Neb. (Apr. '40)

Dunn, Stephen M., Mech. Engr., Bureau of Water Works & Supply, Box 3669 Terminal Annex, Los Angeles, Calif. (Sept. '31)

Dunn, William Carey, Supt., Mt. Hope Filter Plant, Box 1441, Cristobal, Canal Zone (Apr. '19)

Dunnville Public Utilities Com., H. E. Foster, Mgr., Dunnville, Ont., Can. (Corp. M. Jan. '35)

Dunstan, Gilbert H., Asst. Prof. of Mechanics, Univ. of Alabama, University, Ala. (July '31)

Dunstan, James, City Engr., City Engineer's Office, City Hall, Wenatchee, Wash. (Apr. '38)

Dunwoody, J. S., Supt., Water Dept., Erie, Pa. (June '13) *Director '33–'35.*

Du Pre, R. B., City Mgr., 406 Whitlock Ave., Marietta, Ga. (July '35)

Durbin, W. H., Mgr., Terre Haute Water Works Co., 634 Cherry St., Terre Haute, Ind. (May '23)

Durham Water Dept., D. McGregor Williams, City Hall, Durham, N. C. (Corp. M. July '34)

Durner, Fred J., Dist. Sales Mgr., Mathieson Alkali Works, 771 Shady Drive, E., Pittsburgh, Pa. (Oct. '39)

Dutton, Marshall S., Supt. of Water, Municipal Bldg., Oak Park, Ill. (Apr. '37)

Dwyer, John D., Chairman, Water & Sewer Board, 110 S. Border Rd., Medford, Mass. (May '22)

Dyer, Edward A., Supt., Water Dept., Cobleskill, N. Y. (Apr. '37)

Earhart, Fred A., Comr. of Public Utilities, City Hall, New Orleans, La. (July '37)

Earl, George Goodell, Cons. Engr., 1419 Henry Clay Ave., New Orleans, La. (July '07) *Vice-Pres. '11–'14. President, '15. Exec. Com. '16–'17. Honorary M. '26.*

Early, Matt, Water & Sewage Supt., Water Dept., Moscow, Idaho (Apr. '40)

East, L. A., Supt. of Water Works, Savannah, Ga. (Nov. '29)

East Aurora, Village of, Edward D. Neal, Supt. of Water Works, Village Hall, Main St., East Aurora, N. Y. (Corp. M. Apr. '37)

East Bay Munic. Utility Dist., J. S. Longwell, Chief Engr. & Gen. Mgr., 512—16th St., Oakland, Calif. (Corp. M. Sept. '29)

East Chicago Dept. of Water Works, Albert G. Vinick, Supt., 4733 Olcott Ave., East Chicago, Ind. (Corp. M. Jan. '36)

East Helena, City of, Water Dept., John Gough, Supt., East Helena, Mont. (Corp. M. Apr. '38)

East Orange Board of Water Comrs., Water Dept., R. M. Roper, Secy., East Orange, N. J. (Corp. M. Aug. '09)

East York, Township of, Works Com., 443 Sammon Ave., Toronto, Ont., Can. (Corp. M. Jan. '35)

Easterday, E. E., Div. Engr., St. Louis Water Div., 1640 S. Kingshighway, St. Louis, Mo. (May '26)

Eastwood, C., *see* London Public Utilities Com.

Eastwood, Charles H., Wallace & Tiernan Co., Inc., Newark, N. J. (July '35)

Eaton, Thomas J. Supt., Bureau of Water, Amsterdam, N. Y. (July '35)

Ebasco Services Inc., A. C. Clogher, 2 Rector St., New York, N. Y. (Corp. M. Mar. '29)

Ebaugh, Robert M., Asst. Engr., Southern California Water Co., 428 N. Pine St., San Gabriel, Calif. (Jan. '40)

Eberling, Carl A., Supt. Water Works Dept., Room 138, City Hall, Cincinnati, Ohio (June '34)

Ebert, R. E., Chemist, Water Dept., 1368 E. Sprague St., Winston-Salem, N. C. (Dec. '33)

Eby, Earl H., Vice-Pres., Elk River Concrete Products Co., 502 Power Bldg., Helena, Mont. (Apr. '40)

Eck, Girard C., Chemist, Rayonier, Inc., Shelton, Wash. (Jan. '39)

Eckart, Nelson A., Gen. Mgr. & Chief Engr., Water Dept., 425 Mason St., San Francisco, Calif. (Mar. '30) *Director '37–'39.*

Eckert, Alfred, Director of Public Works, 3 Jefferson Court, Saginaw, Mich. (Jan. '29)

Eckert, Otto E., *see* Lansing Board of Water & Elec. Light Comrs.

Eckhardt, Malcolm M., *see* Birmingham Water Co.

Ecusta Paper Corp., Herbert F. Finck, Hydr. Engr., Pisgah Forest, N. C. (Corp. M. Jan. '40)

Eddy, Harrison P., Jr., Cons. Engr., Metcalf & Eddy, Cons. Engrs., 1300 Statler Bldg., Boston, Mass. (Apr. '30)

Eddy, Lyle H., Foreman of Maint. & Const., City Water Dept., 145 Central St., Watertown, N. Y. (Jan. '39)

Eddy Valve Co., John Knickerbacker, Pres., Waterford, N. Y. (Assoc. M. June '86)

Edge, E. F., Supt., Water Works, Shawnee, Okla. (Oct. '39)

Edmonton, City of, W. R. Mount, Engr. & Supt., Waterworks Distr. System, Edmonton, Alta., Can. (Corp. M. July '40)

Edson Corp., J. William Wickwire, 49-51 D St., South Boston, Mass. (Assoc. M. Mar. '23)

Edwards, A. B., Chief Operator, Pumping Plant, Burlington, Ont., Can. (Jan. '37)

Edwards, Gail P., 88-38—69th Ave., Forest Hills, N. Y. (July '34)

Edwards, John C., Chemist & Asst. Mgr., Huntington Water Corp., 720—4th Ave., Huntington, W. Va. (Apr. '39)

Edwards, Robert V., Asst. Secy., American Concrete & Steel Pipe Co., P. O. Box 1428, Arcade Station, Los Angeles, Calif. (Oct. '39)

Edwards, William R., Vice-Pres., New York Water Service Corp., 20 East Ave., Rochester, N. Y (Apr. '14)

Eernisse, J. Guy, Electro-Mech. Engr., Tacoma Water Dept., 402 City Hall, Tacoma, Wash. (Apr. '39)

Egan, J. H., Crane Co., 321 E. Third St., Los Angeles, Calif. (Oct. '31)

Egbert, Donald C., City Mgr., Water Dept., Birmingham, Mich. (Jan. '38)

Eger, Joseph R., Supt. of Filtration, 109 Erin St., Piedmont, W. Va. (Affil. Jan '39)

Eggerling, William J., Water Supt., Irvington, N. Y. (July '39)

Eggleston, H. R., Chemist & Bacteriologist, Dept. of Public Service, Marietta, Ohio (Jan. '39)

Ehlers, V. M., Chief San. Engr., Texas State Dept. of Health, Austin, Tex. (Oct. '27)

Eichinger, E. C., Chemist, Oshkosh Filter & Softener Co., P. O. Box 694, Oshkosh, Wis. (July '37)

El Paso Water Dept., Ashley G. Classen, Supt., P. O. Box 511, El Paso, Tex. (Corp. M. Jan. '39)

Elder, Albert L., Prof. of Chemistry, Syracuse Univ., Bowne Hall, Syracuse, N. Y. (Sept. '28)

Elder, Clayburn C., Hydrographic Engr., Metropolitan Water Dist. of Southern California, 306 W. 3rd St., Los Angeles, Calif. (Aug. '31)

Eldridge, William Jenkson, Water Dept. Supervisor, E. I. Du Pont de Nemours & Co., Rayon Div., Old Hickory, Tenn. (July '40)

Electro Bleaching Gas Co., 9 E. 41st St., New York, N. Y. (Assoc. M. Apr. '13)

Electro Rust-Proofing Co., E. H. Ingle, 743 Third National Bldg., Dayton, Ohio. (Assoc. M. Apr. '39)

Electromarine Corp., Payne Dean, Pres., Westport, Conn. (Assoc. M. Apr. '39)

Eliassen, Rolf, Asst. Prof. of San. Eng., Armour Institute of Technology, 3300 Federal St., Chicago, Ill. (Jan. '35)

Elkhorn Light & Water Com., Neal B. Thayer, Supt., Elkhorn, Wis. (Corp. M. Oct. '35)

Eller, Edwin C., Engr., Rahway Water Dept., 1498 Irving St., Rahway, N. J. (Jan. '40)

Ellerker, Stanley, Supt. of Water Works, Forest, Ont., Can. (July '37)

Elliott, Earl C., Pres., California Water Service Co., P. O. Box 1150, San Jose, Calif. (July '28)

Elliott, Wilson D., Chemist & Bacteriologist, Water Works, Ottumwa, Iowa (Jan. '31)

Ellis, F. K., Supt., Public Works Dept., P. O. Box 128, Sumter, S. C. (Apr. '39)

Ellis, George R., Canandaigua, N. Y. (July '07)

Ellis, Richard H., Engr., Inspection Dept., Associated Factory Mutual Fire Insurance Cos., 184 High St., Boston, Mass. (Apr. '38)

Ellms, Joseph W., Comr. of Sewage Disposal, Dept. of Public Utilities, City Hall, Cleveland, Ohio (Oct. '19) *Trustee '23-'25.*

Ellsworth, Fred D., Local Mgr., California Water Service Co., 132 Main St., Petaluma, Calif. (Oct. '27)

Ellsworth, Harry, Supt., Water & Light Dept., Meadville, Pa. (July '07)

Ellsworth, Samuel M., Cons. Engr., 12 Pearl St., Boston, Mass. (Apr. '30)

Elmira Water Board, H. M. Beardsley, Gen. Mgr., City Hall, Elmira, N. Y. (Corp. M. Mar. '15)

Elnor, G. E., *see* North Bay, City of

Elrod, Henry E., Cons. Engr., 316 Petroleum Bldg., Houston, Tex. (Feb. '16)

Elsman, Ralph, *see* San Jose Water Works

Elting, Oscar R., Asst. Engr., Bureau of Water Supply, 403 Municipal Building, Akron, Ohio (Feb. '30)

Elwell, Paul W., Const. Munic. Engr., 5005 Euclid Ave., Cleveland, Ohio (July '38)

Ely, Howard M., Supt., Water Co., Danville, Ill. (June '09)

Ely, Van Horn, Jr., *see* Philadelphia Suburban Water Co.

Emerson, C. A., Jr., New York Repr., George B. Gascoigne & Assoc., Woolworth Bldg., New York, N. Y. (May '08)

Emerson, Wm., Supt., Water Dept., City Hall, Portland, Ind. (Apr. '40)

Emery, Floyd A., *see* Batavia, City of

Emigh, William C., City Engr., Coatesville, Pa. (Jan. '37)

Emporium Water Co., H. G. Tompkins, Supt., Emporium, Pa. (Corp. M. Mar. '26)

End, Charles F., Supt., Raritan Township Water Dept., Route #19, New Brunswick, N. J. (May '30)

End, William F., Civ. Engr., 2 Georgian Court, Troy, N. Y. (Jan. '26)

Endicott Water Works Co., Earle J. Grippen, Supt., Endicott, N. Y. (Corp. M. Feb. '28)

Engel, P. N., Pres., International Filter Co., 325 W. 25th Place, Chicago, Ill. (June '19)

Enger, M. L., Dean of College of Eng. & Director of Eng. Expt. Station, Univ. of Illinois, Urbana, Ill. (Mar. '15) *Goodell Prize '40.*

"Engineering News-Record," E. J. Cleary, 330 W. 42nd St., New York, N. Y. (Assoc. M. May '18)

Engle, James W., Chem. Engr., 934 N. Irving St., Arlington, Va. (Sept. '23)

English, James A., City Engr. & Supt. of Water Works, Salisbury, N. C. (Dec. '33)

Enslow, Linn H., Editor, *Water Works & Sewerage,* 155 E. 44th St., New York, N. Y. (Aug. '18) *Diven Medal '35. Director '36-'41.*

Entwhistle, Richard R., 314 Hawthorne Ave., Covington, Ky. (Apr. '38)

Erickson, Claud R., Mech. Engr., Board of Water Comrs., 116 W. Ottawa St., Lansing, Mich. (Jan. '40)

Erickson, D. L., City Engr., Lincoln, Neb. (June '24)

Erickson, E. H., Salesman, Crane Co., 126 S. Post St., Spokane, Wash. (Jan. '36)

Erickson, Wendell J., Asst. San. Engr., New York State Dept. of Health, State Office Bldg., Albany, N. Y. (Jan. '24)

Erion, Daniel Ray, Jr., Filter Operator, Milford Water Works, 605 High St., Milford, Ohio (Apr. '40)

Erion, Ray, Supt. & Chemist, Milford Water Works, 605 High St., Milford, Ohio (Apr. '39)

Erwin, Thad M., Water Business Agent, Dept. of Water & Power, Box 3669 Terminal Annex, Los Angeles, Calif. (Sept. '31)

Eschenfelder, A. F., *see* Glen Ridge Water Dept.

Estabrook, Joseph B., 521 Sexton Bldg., Minneapolis, Minn. (Apr. '36)

Estes, N. C., Dist. Mgr., Wallace & Tiernan Co., Inc., 2615 Fannin St., Houston, Tex. (Oct. '38)

Estey, Chas. A., Mgr., Pacific States Cast Iron Pipe Co., 437 So. Hill St., Los Angeles, Calif. (Oct. '37)

Esty, Roger W., Supt., Water Dept., 17 Hobart St., Danvers, Mass. (Mar. '24) *Director '39-'41.*

Eugene Water Board, J. W. McArthur, Gen. Supt.-Secy., 1116 Willamette St., Eugene, Ore. (Corp. M. Jan. '39)

Evans, Edmund Boyce, Sr. Chemist & Bacteriologist, Water Works, 1215 Elgin Pl., Mt. Adams, Cincinnati, Ohio (Jan. '27)

Evans, G. Taylor, Vice.-Pres. & Gen. Mgr., Ohio Water Service Co., Struthers, Ohio (Apr. '28)

Evans, Gomer, Asst. Supt. of Distr., San Diego Water Dept., 3759 Richmond St., San Diego, Calif. (Oct. '39)

Evans, J. Claire, Denver Fire Clay Co., P. O. Box 5510, Denver, Colo. (Jan. '37)

Evans, L. J., Dist. Mgr., Northern Indiana Power Co., Wabash, Ind. (Jan. '37)

Evans, R. W., Mgr., Water Works, Uvalde, Tex. (Jan. '35)

Evans, Samuel A., Asst. Civ. Engr., Bureau of Water Works & Supply, 1438 N. Coronado St., Los Angeles, Calif. (Oct. '34)

Evans, Thos. H., Mgr., Great Falls Pumping Station & Filtration Plant, P. O. Box 809, Great Falls, Mont. (Jan. '39)

Evans, William J., Civ. Engr., Box 819, Oxford, N. C. (Apr. '30)

Evansville Dept. of Water Works, Edwin C. Henning, Pres., Board of Trustees, Evansville, Ind. (Corp. M. May '06)

Everett, Jasper W., Vice-Pres., Springfield City Water Co., Boonville Ave. & Chestnut St., Springfield, Mo. (May '22)

Everett Water Dept., G. G. Paine, City Engr. & Water Supt., 3102 Cedar St., Everett, Wash. (Corp. M. Jan. '35)

Everson Mfg. Co., Roy B. Everson, Pres., 214 W. Huron St., Chicago, Ill. (Assoc. M. Jan. '37)

Every, Elmer D., Pres., Artesian Well & Equipment Co., Rochelle Park, N. J. (Apr. '38)

Evrard, James A., % State School, Glenwood, Iowa (Apr. '39)

Eyer, Claude W., Supt., Water Dept., City Hall, Glendive, Mont. (Feb. '31) *Fuller Award '38.*

Eyer, Frank A., Pres., Selinsgrove Water Supply Co., 21 S. Market St., Selinsgrove, Pa. (Apr. '37)

Faber, Harry A., San. Chemist, The Chlorine Institute, Inc., 50 E. 41st St., New York, N. Y. (July '35)

Fager, E. P., Dearborn Chemical Co., 310 So. Michigan Ave., Chicago, Ill. (Aug. '20)

Fague, Hugh F., Supt. of Const. & Maint., Bureau of Water Works, 1900 N. Interstate Ave., Portland, Ore. (May '33)

Fahlstrom, David, 427 School St., Putnam, Conn. (July '35)

Fair, Gordon Maskew, Prof. of San. Eng., Harvard Univ., 7 Scott St., Cambridge, Mass. (Jan. '25)

Fairbairn, John M., Inspection Engr., Chas. Warnock & Co., Ltd., 1000 McGill Bldg., 485 McGill St., Montreal, Que., Can. (Apr. '34)

Fales, Almon L., Cons. Engr., Metcalf & Eddy, Cons. Engrs., 1300 Statler Bldg., Boston, Mass. (Feb. '21)

Falls, O. M., *see* York, Township of

Fanning, A. L., Supt., Water Dept., Yukon, Okla. (Oct. '39)

Farley, John L., Jr., 1716 Redfern Ave., Far Rockaway, N. Y. (Jan. '39)

Farnan Brass Works Co., Louis P. Smith, Pres., P. O. Box 6147, Cleveland, Ohio (Assoc. M. May '92)

Farquharson, Alex L., Mgr., Brockville Public Utilities, Victoria Hall, Brockville, Ont., Can. (Mar. '24)

Farrell, J. W. D., *see* Regina Water Works Dept.

Farrell, R. P., Assoc. San. Engr., Tennessee Dept. of Public Health, 420 Sixth Ave. N., Nashville, Tenn. (Apr. '39)

Farson, C. L., Supt., Trotter Water Co., Uniontown, Pa. (July '39)

Farver, Roy, Supt. & Clerk, Board of Public Affairs, West Milton, Ohio (Apr. '40)

Fassnacht, George C., 2277 Andrews Ave., Apt. 6H, New York, N. Y. (Jr. M. Jan. '40)

Faulks, J. Harris, Sales Repr., Neptune Meter Co., 20 Bailey Rd., Maplewood, N. J. (Oct. '35)

Faulks, Theo. D., 282 Roseville Ave., Newark, N. J. (Apr. '37)

Faust, Raymond J., Asst. Engr., Michigan Dept. of Health, Lansing, Mich. (Jan. '38)

Faw, Claude T., California Corrugated Culvert Co., 600 Haddon Rd., Oakland, Calif. (Nov. '29)

Fawcett, L. T., Secy. & Chief Engr., Mahoning Valley San. Dist., Box 298, Youngstown, Ohio (July '39)

Fawkes, A. W. Ellson, City Engr., City of Moose Jaw, Moose Jaw, Sask., Can. (Apr. '38)

Feben, Douglas, Sr. San. Chemist, City Filtration Plant, Water Works Park, Detroit, Mich. (Jan. '36)

Federal Advisers, Inc., J. S. Thornton, Purchasing Agent, 70 Pine St., New York, N. Y. (Corp. M. Jan. '39)

Federal Pipe & Tank Co., Leon H. Spaulding, 6851 E. Marginal Way, Seattle, Wash. (Assoc. M. Feb. '31)

Feeney, A. J., Asst. Engr., Water Dept., Wilmington, Del. (Apr. '19)

Feitel, Ed. E., Pres. & Gen. Mgr., Water Works, Harvey, La. (Apr. '38)

Fellers, Frank L., Supt., Water Dept., 422 Bonnardell Ave., Sebastopol, Calif. (Oct. '39)

Fenkell, George H., R.F.D. Fenkell Farms, Almont, Lapeer County, Mich. (June '20) *Trustee '26-'28. Vice-Pres. '30. President '31. Director '32, '38-'41. Honorary M. '40.*

Fenn, N. Frederick, Gen. Mgr., South Bay Consolidated Water Co., Bay Shore, L. I., N. Y. (Nov. '27)

Fenton, M. F., Los Angeles Mgr., Wailes Dove-Hermiston Corp., 2461 E. 8th St., Los Angeles, Calif. (Dec. '32)

Ferem, Walter, Pres. & Gen. Mgr., The Walter Ferem Co., 112 W. 9th St., Los Angeles, Calif. (Jan. '40)

Fergus Falls Water Dept., Joseph E. Young, Supt., Fergus Falls, Minn. (Corp. M. July '38)

Ferguson, G. H., Chief San. Engr., Dept. of Pensions & National Health, 326 Daly Bldg., Ottawa, Ont., Can. (Mar. '25)

Fernandez y Simon, Abel, Ingeniero Consultor, Ave. de la Republica No. 455, Havana, Cuba (Jan. '39)

Fewell, J. H., Engr. & Supt. of Const., Jackson Water Works, Jackson, Miss. (June '26)

Fiedler, Albert G., Div. of Ground Water, U. S. Geological Survey, Washington, D. C. (Jan. '29) *Goodell Prize '39.*

Field, Frederick E., Engr., Water Board, 135 Ballantyne Ave., Montreal, West, P.Q., Can. (June '20)

Field, H. L., Supt., Water Dept., Greenfield, Mass. (June '29)

Field, Ross B., Service Draftsman, Bureau of Water Works & Supply, Box 3669 Terminal Annex, Los Angeles, Calif. (July '35)

Field, William T., Pres., William T. Field Engrs., Inc., Flower Bldg., Watertown, N. Y. (Apr. '10)

Filby, E. L., Black & Veatch, Cons. Engrs., 4706 Broadway, Kansas City, Mo. (Feb. '22)

Filipi, T. A., Public Health Engr., State Dept. Health, 1017 State House, Lincoln, Neb. (Jan. '38)

Finch, Lewis S., Civ. Engr., 276 Century Bldg., Indianapolis, Ind. (Oct. '33)

Finch, Ronald M., Div. Mgr., Wallace & Tiernan Co., Inc., 414 Flour Exchange Bldg., Minneapolis, Minn. (May '25)

Finck, Herbert F., *see* Ecusta Paper Corp.

Findlan, John S., Comr. of Finance, Water Dept., City Hall, St. Paul, Minn. (Oct. '38)

Finerty, Hugh P., Trustee, Council Bluffs City Water Works, Council Bluffs, Iowa (Apr. '38)

Finkbeiner, Carleton S., Cons. Engr., 1025 Nicholas Bldg., Toledo, Ohio (Jan. '38)

Fire Underwriters Inspection Bureau, Sanford Herberg, Engr., 1229 Plymouth Bldg., Minneapolis, Minn. (Corp. M. Feb. '24)

Fischer, F. P., Sales Engr., Wallace & Tiernan Co., 811 Perry Payne Bldg., Cleveland, Ohio (July '37)

Fiscus, David H., Engr., California Water & Telephone Co., 19 W. 9th St., National City, Calif. (Oct. '35)

Fisher, H. Buford, Personnel Mgr., East Bay Munic. Utility Dist., 512—16th St., Oakland, Calif. (Oct. '39)

Fisher, L. A., Supt., Board of Water & Light Com., Concord, N. C. (Jan. '14)

Fisher, L. M., Interstate San. Dist., Riggs Bank Bldg., 14th & Park Rd., N. W., Washington, D. C. (July '35)

Fisher Research Labs., Gerhard R. Fisher, 745 Emerson St., Palo Alto, Calif. (July '38)

Fishers Island Farms, Inc., Harold J. Baker, Fishers Island, N. Y. (Corp. M. May '30)

Fishtein, Max, 59 E. Van Buren St., Chicago, Ill. (Dec. '27)

Fishwick, E. T., Vice-Pres., Worthington Pump & Machinery Corp., 401 Worthington Ave., Harrison, N. J. (Jan. '36)

Fitz, A. Stover, Borough Mgr., 315 Fairview Ave., Waynesboro, Pa. (Jan. '37)

Fitzgerald, Carl C., First Asst. Engr., Waterworks Dist. Secy., 150 Balmoral Ave., Toronto, Ont., Can. (Apr. '39)

Fitzgerald, Gerald C., Civ. & Hydr. Engr., 625 Rowan Bldg., Los Angeles, Calif. (Apr. '29)

Fitzgerald, R. W., Chief Chemist, Div. of Water, Norfolk, Va. (July '38)

Five, Helge, Adminstrative Headquarters, L. I. State Park Com., Babylon, N. Y. (Jan. '39)

Fiveash, Charles E., Supt. of Plants, Water & Sewage Dept., P. O. Box 1113, Fort Lauderdale, Fla. (July '39)

Flaa, Ingwald E., Hydr. Engr., San Francisco Water Dept., 425 Mason St., San Francisco, Calif. (May '15)

Flack, Horace E., Executive, Dept. Legislative Reference, City Hall, Baltimore, Md. (June '19)

Flanagan, John C., Asst. Secy. & Registrar, Water Dept., St. Paul, Minn. (July '35)

Flanders, W. C., Sales Mgr., Worthington-Gamon Meter Co., 916 Lake St., Newark, N. J. (Oct. '35)

Flannery, Charles A., Sales Mgr., Industrial Engineering Co., 223rd St. At Alameda, P. O. Box 457, Wilmington, Calif. (Oct. '38)

Flannery, William, The Towers, Clark, Willow & Pineapple Sts., Brooklyn, N. Y. (May '21)

Fleming, Edward H., Supt., Mojave Div., Los Angeles Aqueduct, Mojave, Calif. (Oct. '34)

Fleming, Thomas W., Chief Clerk, Water System, Municipal Bldg., Belleville, N. J. (July '39)

Fleming, Virgil R., Univ. of Illinois, 209 Materials Testing Lab., Urbana, Ill. (Apr. '15)

Flentje, Martin E., 5 Hamilton Rd., Glen Ridge, N. J. (Mar. '26)

Fletcher, Alex, Jr., Filter Plant Operator, Tennessee Valley Authority, Watts Bar Dam, Tenn. (Jan. '40)

Fletcher, Alfred H., San. Engr., Dept. of Health, Memphis, Tenn. (Jan. '36)

Flexible Sewer Rod Equipment Co., H. R. Crane, 9059 Venice Blvd., Los Angeles, Calif. (Assoc. M. Jan. '38)

Flinn, Thomas C., Cons. Engr., 277 Broadway, New York, N. Y. (Apr. '37)

Flint Water Dept., E. L. Halloway, City Hall, Flint, Mich. (Corp. M. Nov. '25)

Flook, Samuel E., Supt., Waterworks Dept., Public Utilities Bldg., Port Arthur, Ont., Can. (Jan. '36)

Florence, Harold V., Gen. Foreman, Ridgewood Water Dept., Ridgewood, N. J. (Affil. Oct. '38)

Flory, Harry E., Treas., Blue Mountain Consolidated Water Co., Nazareth, Pa. (Apr. '37)

Foerster, Wm. K., Water Supt., Maywood Mutual Water Co., #2, 4427 E. Slawson St., Maywood, Calif. (July '39)

Foggie, John, Chief San. Inspector, Dept. of Health & Public Welfare, Legislative Bldgs., Winnipeg, Man., Can. (Apr. '37)

Foist, George M., Dist. Mgr., Public Service Co. of Indiana, Franklin, Ind. (Jan. '37)

Folger, Collamer C., Gen. Mgr., Public Utilities Com., Kingston, Ont., Can. (Mar. '34)

Foltz, A. V., Asst. Water Works Supt., Findlay Water Works, 110 N. Blanchard St., Findlay, Ohio (Apr. '39)

Fond du Lac City Water Dept., E. J. Braun, Supt., Fond du Lac, Wis. (Corp. M. May '19)

Foote, Herbert B., Director, Div. Water & Sewage, State Board of Health, Helena, Mont. (Aug. '23) *Director '32–'33.*

Forbes, H. De B., Cons. Engr., Richmond, Ky. (Oct. '39)

Ford, H. W., Pittsburgh-Des Moines Steel Co., 270 Broadway, New York, N. Y. (July '35)

Ford, J. W., Supt. & Engr., San Jose Water Works, 374 W. Santa Clara St., San Jose, Calif. (Jan. '24)

Ford, John L., Sales Mgr., Ford Meter Box Co., Wabash, Ind. (Jan. '36)

Ford Meter Box Co., 718 Redman Ave., Haddonfield, N. J. (Assoc. M. May '08)

Ford, T. B., Jr., Sanki Engineering Co., Ltd., Sanshin Bldg., Hibiya, Tokyo, Japan (Oct. '31)

Ford, Walter A., Supt., Cortland Water Board, Cortland, N. Y. (Jan. '36)

Ford, Wilbur E., Wabash, Ind. (July '35)

Fore, Clifford, Chief Operator, Munic. Water Works, Carbondale, Ill. (Jan. '37)

Foreman, Charles S., Pres., C. S. Foreman Co., 841 New York Life Bldg., Kansas City, Mo. (June '20)

Foreman, Merle S., Bacteriologist & Chemist, State Board of Health, 825 Cragmont Ave., Berkeley, Calif. (Jan. '28)

Forgey, Carl S., Tech. Div., East Bay Munic. Utility Dist., 512—16th St., Oakland, Calif. (June '33)

Forrest, T. C., Jr., Cons. Engr., Praetorian Bldg., Dallas, Tex. (Oct. '39)

Forsberg, Ole, Chemist, Oliver Iron Mining Co., Hibbing, Minn. (Mar. '21) *Director '34–'36.*

Forster, Cyril, Mgr., Palmerston Public Utilities, Box 87, Palmerston, Ont., Can. (Jan. '40)

Fort Collins, City of, Burgis G. Coy, City Engr., City Hall, Fort Collins, Colo. (Corp. M. Mar. '26)

Foster, Buck, Supt., Water Dept., Broken Bow, Okla. (Oct. '39)

Foster, Charles, 316 Medical Arts Bldg., Duluth, Minn. (June '19)

Foster, H. E., *see* Dunnville Public Utilities Com.

Foster, Herbert B., Jr., Asst. San. Engr., State Dept. of Public Health, 377 Coventry Rd., Berkeley, Calif. (Oct. '39)

Foulds, Thos. H., Mgr., Whittier Water Co., 109 W. Bailey St., Whittier, Calif. (Apr. '36)

Foulk, C. W., Prof. of Anal. Chemistry, Ohio State Univ., Columbus, Ohio (June '26)

Fowler, Edward A., 366 Pine St., New Orleans, La. (Apr. '10)

Fowler, H. D., Civ. Engr., P. O. Box 3084, Seattle, Wash. (July '36)

Fowler, James D., Cons. Engr., Central Bank Bldg., Dallas, Tex. (July '35)

Fowler, Roy W., City Engr., City Hall, Santa Cruz, Calif. (Oct. '37)

Fox, Chas. L., Asst. Supt., Pennsylvania Water Co., 712 South Ave., Wilkinsburg, Pa. (June '12)

Fox, Paul S., San. Engr., Bureau of Pub. Health, P. O. Box 750, Santa Fe, N. M. (Oct. '24)

Fox, Robert M., Prof. of Civ. Eng., Univ. of Southern California, Los Angeles, Calif. (Jan. '37)

Foxboro Co., W. E. Booth, Neponset Ave., Foxboro, Mass. (Assoc. M. Jan. '37)

Frame, Paul D., Pres., Ulrich Chemical Co., Inc., 31 E. Georgia St., Indianapolis, Ind. (Dec. '37)

Francis, George Walden, Cons. Engr. & Mgr., The Francis Engineering Co., 303 Eddy Bldg., Saginaw, Mich. (Apr. '38)

Francis, James G., Civ. Engr., Dept. of Water & Power, 148 Laurel Drive, Altadena, Calif. (Oct. '31)

Frank, O. B., Mgr., Conservative Water Co., 8627 Fir St., Los Angeles, Calif. (July '35)

Franklin, C. H., *see* Harlan Munic. Water Works

Franklin, W. M., Box 3162, Dilworth Station, Charlotte, N. C. (July '35)

Franz, Edwin F., Asst. San. Engr., State Dept. of Health, 2508 Meadow Rd., Louisville, Ky. (Oct. '39)

Fraschina, Keeno, Water Purif. Engr., San Francisco Water Dept., 1666 Lombard St., San Francisco, Calif. (Jan. '39)

Fraser Cement Products Co., R. J. Fraser, Jr., 3115 San Fernando Rd., Los Angeles, Calif. (Assoc. M. Oct. '38)

Frazza, Louis F., Salesman, Johns-Manville Sales Corp., 270 Madison Ave., Paterson, N. J. (Oct. '39)

Freeburn, H. M., Dist. Engr., Pennsylvania Dept. of Health, 1251 Montgomery Ave., Wynnewood, Pa. (May '22)

Freer, W. D., American Water Works & Elec. Co., 50 Broad St., New York, N. Y. (Mar. '24)

Freiberger, Wm. J., Supt., Sylvan Spring Water Co., Sylvan Beach, Oneida County, N. Y. (Jan. '38)

French, Dudley K., 503 Hawthorne Lane, Winnetka, Ill. (May '19)

French, E. J., Water Supt., Toledo, Ore. (Apr. '39)

French, E. V., Mech. Engr., 185 Franklin St., Boston, Mass. (July '06)

Fresno City Water Dept., Claude H. Weekes, Supt., 1926 Tuolumne St., Box 1274, Fresno, Calif. (Corp. M. Jan. '32)

Frew, Archie, Chemist, Vincennes Water Dept., Vincennes, Ind. (Oct. '39)

Frey, Edward W., Principal Clerk, Detroit Dept. of Water Supply, 8300 W. Warren Ave., Dearborn, Mich. (Jan. '40)

Frick, A. L., Jr., Dist. Mgr., Wallace & Tiernan Sales Corp., 2311 E. 8th St., Los Angeles, Calif. (July '37)

Fricker, Emile J., Asst. To Pres., Hackensack Water Co., 624 Park Ave., Weehawken, N. J. (Mar. '25)

Frieberg, G. W., *see* Anheuser-Busch, Inc.

Friedman, Samuel, Chemist, Catskill Lab., Ashokan, N. Y. (Nov. '29)

Friel, Francis S., Albright & Friel, Inc., 1520 Locust St., Philadelphia, Pa. (Mar. '26)

Friese, John H., Asst. Engr., City of White Plains, 255 Main St., White Plains, N. Y. (Affil. Jan. '39)

Frisk, Paul W., Chem. Engr., 920 Haywood Rd., Asheville, N. C. (Mar. '29) *Director '38-'40.*

Frith, Gilbert R., Asst. Engr., Div. of San. Eng., State Board of Health, Atlanta, Ga. (July '37)

Fritz, William G., Contractor, West Orange, N. J. (May '24)

Frye, Horace R., Asst. Supt., Water Dept., Sheridan Rd. & Lincoln St., Evanston, Ill. (Mar. '34)

Fugate, G. L., Chief Engr., Water Dept., 631 Harvard St., Houston, Tex. (Oct. '38)

Fulkman, John A., Hydr. Engr., Consoer Townsend & Quinlan, Inc., 1300 Times Bldg., Chicago, Ill. (July '28)

Fuller, A. K., Dist. Cashier, California Water & Telephone Co., 971 Orange Ave., Coronado, Calif. (July '38)

Fuller, George B., Mgr., Public Utilities Com., Watford, Ont., Can. (Jan. '37)

Fuller, Harry U., Chief Engr., Portland Water Dist., 16 Casco St., Portland, Me. (Aug. '32)

Fuller, M. M., Supt., City Water Dept., P. O. Box C, San Jacinto, Calif. (July '40)

Fulton, Angus Anderson, Water Works Engr. to Corp. of Dundee, 17 City Square, Dundee, Scotland (Oct. '37)

Furman, Robert W., 1443 Kenyon Drive, Toledo, Ohio (May '22)

Gaboury, M. A., Provincial Bureau of Health, 89 Notre Dame St., E., Montreal, P.Q., Can. (Jan. '34)

Gaffney, L. V., Supt., Water Dept., Gaffney, S. C. (July '38)

Gahn, Harry A., Supt., Water Plant, Fort Pierce, Fla. (July '39)

Gallagher, Clem A., Supt. of Services & Meters, Louisville Water Co., 435 S. Third St., Louisville, Ky. (July '36)

Gallagher, H. A., Mgr., Water Co., Independence, Mo. (June '09)

Gallagher, J. A., Supt., Water Dept., City Hall, Corvallis, Ore. (Jan. '40)

Gallaher, William U., Box 262, Appleton, Wis. (Mar. '25)

Galligan, William E., Assoc. Prof. of Civ. Eng., 3218 Oakland Ave., Ames, Iowa (Oct. '34)

Galloway, James L., Supt. of Filtration, Water Dept., Marysville, Mich. (July '38)

Gama, Jose, Ave. Chapultepec #27, Mexico City, Mexico (June '33)

Gananoque Water Works Com., Gananoque, Ont., Can. (Corp. M. Mar. '27)

Gannett, Farley, Pres., Gannett, Eastman & Fleming, Inc., Harrisburg, Pa. (Jan. '35)

Garcia-Montes, Jose, Jr., Civ. Engr., Avenida de Belgica No. 4, Havana, Cuba (Jan. '36)

Garcia, Raul Ressano, Chief Engr., Common Council of Cascaes, R. Visconde da Lus 56, Cascaes, Portugal (May '33)

Garden City, Inc. Village of, A. H. Rogers, Supt. of Public Works, 110 Seventh St., Garden City, N. Y. (Corp. M. Apr. '40)

Gardner, Clarke, Cons. & City Engr., City Hall, Salisbury, Md. (July '36)

Gardner, Evan D., City Engr., City Hall, Eureka, Calif. (Oct. '39)

Gardner, Joe H., Pres., Bingham & Taylor Corp., 575-601 Howard St., Buffalo, N. Y. (Apr. '37)

Garman, Glen J., *see* Lafayette Water Works

Garman, H. O., Cons. Engr., 836 K. of P. Bldg., Indianapolis, Ind. (May '16)

Garner, C. C., Supt. of Water Works, Laurens, Iowa (Apr. '40)

Garnett, George W., *see* Port Hope Waterworks Com.

Garratt, James Ernest, Designing Engr., Div. of Water, City Hall Annex, Newark, N. J. (May '30)

Garrett, G. H., Chief Engr., Thompson Mfg. Co., 3001 Larimer St., Denver, Colo. (July '39)

Garrison, J. M., Supt., Water & Light Dept., Rock Hill, S. C. (Apr. '37)

Garrity, Leo V., Assoc. Civ. Engr., Dept. of Water Supply, 9300 W. Jefferson Ave., Detroit, Mich. (July '40)

Garvin, A. G., *see* Suburban Water Co.

Gascoigne, George B., Cons. San Engr., 1140 Leader Bldg., Cleveland, Ohio (June '20)

Gaspard, August, Supervisor of Plumbing, Sewerage & Water Board of New Orleans, 526 Carondelet St., New Orleans, La. (July '37)

Gates, Justin F., Comr. of Public Works, City Hall, Middletown, N. Y. (Feb. '31)

Gauer, Paul G., Chief Engr., City Water Dept., 315 N. Hancock St., Madison, Wis. (May '30)

Gausmann, R. W., Ulen & Co., No. 8 Caragheorghi St., Athens, Greece (Mar. '24)

Gauthier, C. W., Supt., Belle River, Ont., Can. (Jan. '38)

Gavett, Weston, San. & Hydr. Engr., 973 Kenyon Ave., Plainfield, N. J. (Nov. '14)

Gayton, Loran D., City Engr., 402 City Hall, Chicago, Ill. (Oct. '24)

Gearhart, John C., Jr. Engr., Stevens & Koon, 1203 Spalding Bldg., Portland, Ore. (Jan. '39)

Gebhart, Earl, Supt., Middletown Water Works, 116 Baltimore St., Middletown, Ohio (Apr. '39)

Gee, W. H., *see* Palisades Interstate Park Com.

Geisler, Paul W., Salesman, Alco Products, Inc., 30 Church St., New York, N. Y. (Apr. '37)

Gelston, W. R., Supt., Water Works Com., Quincy, Ill. (May '07) *Director '34-'36.*

Gelston, W. R., Jr., *see* Quincy Water Works Com.

Gemperle, P. F., 658 S. Euclid Ave., Pasadena, Calif. (Aug. '30)

General Chemical Co., L. I. Birdsall, 105 W. Madison St., Chicago, Ill. (Assoc. M. June '02)

General Paint Corp., Hill, Hubbell & Co. Div., Deming Bronson, Vice-Pres., 3091 Mayfield Rd., Cleveland, Ohio (Assoc. M. Jan. '38)

General Utilities Co., Ltd., A. L. Murray, Mng. Director, 1029 Marine Bldg., Vancouver, Can. (Corp. M. Jan. '38)

Georgalas, Andrew C., Director and Chief Engr., Societe des Eaux, 2, America St., Athens, Greece (July '30)

George, J. M., Supt., Light & Water Dept., Thomaston, Ga. (Jan. '34)

George, Lloyd, Salesman, Mueller Co., 6042 Indianola Ave., Indianapolis, Ind. (Apr. '40)

Gerardy, Maurice N., Hydr. Engr., Dept. of Water Supply, Water Board Bldg., Detroit, Mich. (Mar. '22)

Gerber, Henry M., *see* Louisville Water Co.

Gerber, Winfred D., Engr., State Water Survey Div., 406 Florida St., Urbana, Ill. (Apr. '29)

Gerstacker, Hans, Operation Foreman, Deer Lodge Water Dept., Post Box 476, Deer Lodge, Mont. (July '35)

Gerstein, H. H., San Engr., Dept. of Public Works, 6826 Clyde Ave., Chicago, Ill. (Dec. '25)

Gettrust, J. S., Supt., Akron Filtration Plant, Kent, Ohio (June '21)

Getz, John G., Pres., Northern Illinois Water Corp., General Motors Bldg., Detroit, Mich. (Jan. '39)

Geupel, Louis A., Supt. of Water Works Dept., City Hall, Evansville, Ind. (Nov. '22)

Geyer, John C., Latrobe Hall, Johns Hopkins Univ., Baltimore, Md. (Oct. '34)

Ghiotto, Louis A., Supt. of Pipe Const., Bureau of Water Works & Supply, 4337 Finley Ave., Los Angeles, Calif. (Apr. '36)

Giacomazzi, P. A., Supt. of Const., Santa Paula Waterworks, Santa Paula, Calif. (Nov. '23)

Giannetti, Arnold S., Engr., Montclair Water Bureau, 54 Watchung Ave., Montclair, N. J. (Affil. Jan. '39)

Gibbons, Mortimer M., 961 Frelinghuysen Ave., Newark, N. J. (Nov. '22)

Gibney, Wm. J., Repr., Buffalo Meter Co., 90 Roycroft Blvd., Snyder, N. Y. (July '40)

Gibson, E. W., Mgr., Oregon Culvert & Pipe Co., 2321 S. E. Gladstone St., Portland, Ore. (Jan. '35)

Gibson, James E., Mgr. & Engr., Water Dept., 14 George St., Charleston, S. C. (May '22) *Trustee '25–'26. Vice-Pres. '27. President '28. Diven Medal '29. Exec. Com. '29–'30. Director '31. Honorary M. '40.*

Gibson, Lee, Water Plant Operator, Albany, Tex. (Oct. '39)

Gibson, W. B., Chemist, Water Treatment Plant, Fort Myers, Fla. (Oct. '37)

Gibson, William R., San. Engr., 1201 Textile Tower, Seattle, Wash. (Jan. '38)

Gidley, Harry K., Assoc. Engr., State Health Dept., Charleston, W. Va. (Affil. Jan. '39)

Gidley, Henry T., Supt., Fairhaven Water Co., Fairhaven, Mass. (May '23)

Gilbert, Joseph J., San. Engr., 201 Wheatsheaf Lane, Abington, Pa. (July '37)

Gilcreas, F. Wellington, Assoc. San. Chemist, Div. of Labs. & Research, State Dept. of Health, New Scotland Ave., Albany, N. Y. (Apr. '24)

Gilkison, Geo. F., Supt. of Filtration, Water Dept., Kansas City, Mo. (Apr. '20)

Gill, John B., Sales Supervisor, Johns-Manville Sales Corp., 116 New Montgomery St., San Francisco, Calif. (Jan. '40)

Gillespie, C. G., Chief, Bureau of San. Eng., Dept. of Public Health, 3093 Life Sciences Bldg., Berkeley, Calif. (June '11)

Gillett, S. Howard, Acct., Windsor Utilities Com., 2090 Wyandotte St., E., Windsor, Ont., Can. (Apr. '40)

Gilman, N. A., City Water Supt., Yakima, Wash. (June '34)

Gilstrap, J. R., Supt., Water Dept., Box 24, Haskell, Tex. (Oct. '39)

Giquel, R. Sanchez, Engr., State Water Works, Dept. of Public Works, Calle 27—117, Vedado, Havana, Cuba (July '38)

Girdwood, A. R., *see* Shenango Valley Water Co.

Gittings, Wilbur, Supt., Water Dept., City Hall, Tell City, Ind. (Jan. '40)

Glace, I. M., Cons. Engr., 22 S. 22nd St., Harrisburg, Pa. (Nov. '21)

Glamorgan Pipe & Foundry Co., W. W. Winfree, Lynchburg, Va. (Assoc. M. Nov. '07)

Glannan, Peter H., Supt., Commonwealth Water Co., West Orange Div., 22 Northfield Rd., West Orange, N. J. (June 21)

Glassbrook, E. F., Mgr., Public Utilities California Corp., Niles, Calif. (Apr. '30)

Gleeson, L. T., Supt., Water Dept., Ferris, Tex. (Oct. '39)

Glen Ridge Water Dept., A. F. Eschenfelder, Borough Engr., Glen Ridge, N. J. (Corp. M. Oct. '22)

Glendale Public Service Dept., Peter Diederich, Supt., 120 N. Howard St., Glendale, Calif. (Corp. M. Dec. '14)

Glenn, Charles A., Chemical Casting Sales, Lynchburg Foundry Co., Lynchburg, Va. (Jan. '39)

Glens Falls Board of Water Comrs., Ernest L. H. Meyer, Supt., Glens Falls, N. Y. (Corp. M. Oct. '18)

Glidden, A. Leland, Pres., New Canaan Water Co., New Canaan, Conn. (July '35)

Glueck, Frank J., Const. Engr., 1258 Commercial Trust Bldg., Philadelphia, Pa. (Apr. '37)

Glynn, W. J., 98 Frazier St., Brockport, N. Y. (July '35)

Gobble, J. S., Asst. Engr., State Water Survey Div., 6 Buena Vista Court, Urbana, Ill. (Jan. '39)

Goble, W. F., Mgr., California Water & Telephone Co., 2130 Huntington

Drive, San Marino, Calif. (June '26)

Godet, Henry, Office Mgr., Water Dept., City Hall, East Orange, N. J. (Affil. Oct. '38)

Godwin, George H., Div. Mgr., Alabama Water Service Co., P. O. Box 1066, Decatur, Ala. (Apr. '36)

Goehring, Edwin C., Chem. Engr., Beaver Valley Water Co., 1112 3rd Ave., New Brighton, Pa. (Apr. '39)

Goetz, John A., Supt. Water Dept., Mattoon, Ill. (Apr. '38)

Goff, William A., Cons. Engr., Cunard Bldg., 200 S. 16th St., Philadelphia, Pa. (July '37)

Goit, Laurance E., Engr., Water Distr. & Operation, Dept. of Water & Power, 410 Ducommun St., Los Angeles, Calif. (Oct. '34) *Goodell Prize, '37.*

Golden-Anderson Valve Specialty Co., J. A. Voland, Gen. Mgr., 1315 Fulton Bldg., Pittsburgh, Pa. (Assoc. M. Oct. '34)

Golden, A. T., Water Treatment Plant Operator, Dept. of Water & Power, 5837—7th Ave., Los Angeles, Calif. (Apr. '33)

Golden, George, Supt., 30 Gerald Ave., Highland Park, Mich. (Jan. '38)

Golder, Hugh C., Technical Mgr., Economic Water Softeners, Ltd., Agua Works, Warwick Rd., Tyseley, Birmingham, England (July '37)

Goldsmith, Clarence, National Board of Fire Underwriters, 222 W. Adams St., Chicago, Ill. (Dec. '15)

Goldsworthy, C. M., Auditor, California Water & Telephone Co., 601 Lighthouse Ave., Pacific Grove, Calif. (Oct. '38)

Gooch, E. W., Water Comr., Water Dept., City Hall, Bellingham, Wash. (Affil. Apr. '40)

Gooch, W. T., Prof. of Chemistry, Baylor Univ., Chemist, Waco City Water Works, 808 Speight Ave., Waco, Tex. (Apr. '25)

Good, Timothy W., Supt., Water Works, Cambridge, Mass. (Feb. '20)

Goodale, Leon A., Water Comr. and Registrar, Room 19 City Hall, Worcester, Mass. (Mar. '29)

Goodell, J. E., Chemist, Old City Hall Bldg., Lancaster, Pa. (Apr. '24)

Gooding, Gerald J., 77 Hamilton Ave., New Rochelle, N. Y. (June '30)

Goodman, Adolph E., Assoc. Engr., Bureau of Water Supply, 120 Sage Ave., Akron, Ohio (Apr. '39)

Goodman, Joseph, Deputy Chief Engr., Bureau of Water Supply, Municipal Bldg., New York, N. Y. (Apr. '30)

Goodrich, Levi, City Engr., Marlin, Tex. (July '35)

Goodspeed, Richard C., Pres. & Gen. Mgr., East Pasadena Water Co., Ltd., 1715 Fair Oaks Ave., South Pasadena, Calif. (July '37)

Goodwin, James W., Cons. Engr., J. W. Goodwin Eng. Co., 1244 Martin Bldg., Birmingham, Ala. (Jan. '40)

Gordon, Fred F., Cons. Engr., 1200 Park Ave., Rochester, N. Y. (July '35)

Gordon, F. G., Cons. Engr., 53 W. Jackson Blvd., Chicago, Ill. (June '21)

Gordon, J. B., *see* District of Columbia Water Dept.

Gordon, Jack, Supt., Rochester Water Dept., Rochester, Ind. (Oct. '39)

Gordon, Murray L., Town Engr., Box 95, Truro, N.S., Can. (Jan. '37)

Gorman, Arthur E., 6743 Olympia Ave., Chicago, Ill. (Mar. '24) *Diven Medal '27.*

Gorman, Richard C., Jr., 44 Genesee St., Hornell, N. Y. (May '29)

Gorman-Rupp Co., The, J. C. Gorman, Mansfield, Ohio (Assoc. M. Jan. '40)

Gosney, B. C., Supt., City Water Dept., Auburn, Wash. (July '38)

Gotaas, Harold B., Asst. Prof. San. Eng., Univ. of North Carolina, Chapel Hill, N. C. (Jan. '38)

Göteborgs Vattenledningsverk, P. G. Blidberg, Director, Göteborg, Sweden (Corp. M. Jan. '38)

Goudey, Ray F., San. Engr., Dept. of Water & Power, Box 3669 Terminal Annex, Los Angeles, Calif. (Apr. '18) *Fuller Award '40.*

Gouger, M. M., Vice-Pres. & Gen. Mgr., East Bethlehem Water Co., Donora, Pa. (July '39)

Gough, John, *see* East Helena, City of

Gould, Harry W., Supt., Pumping Station, Water Works Park, Detroit, Mich. (Jan. '30)

Grabb, George W., Water Works Supt., Chesley, Ont., Can. (Mar. '32)

Grady, Robert H., Research Fellow, North Carolina State College, 6 Ferndell Lane, Raleigh, N. C. (Jr. M. Jan. '40)

Graf, August V., Chief Chem. Engr., Water Purif. Plants, Howard Bend Station, Chesterfield, Mo. (June '14) *Fuller Award '40.*

Graham, D. W., Chief Chemist & Bacteriologist, Bureau of Water Works & Supply, Box 3669 Terminal Annex, Los Angeles, Calif. (Jan. '38)

Graham, Granville E., Supt., San Pablo Filter Plant, East Bay Munic. Utility Dist., 245 Berkeley Park Blvd., Berkeley, Calif. (June '33)

Graham, Wm. H., Supt. Boro of Verona, Municipal Bldg., Verona, N. J. (Oct. '38)

Gram, A. L., Exec. Secy., Metropolitan Water Dist. of Southern California, 1870 Los Robles Ave., San Marino, Calif. (Jan. '37)

Gran, John E., School of Chemistry, Univ. of Alabama, University, Ala. (Apr. '38)

Grand Rapids Water Dept., C. O. Johnson, City Mgr., Grand Rapids, Mich. (Corp. M. Feb. '13)

Granda y Deben, Robel, San. Engr., Public Health Service, Estrada Palama 214 Esq. a Concejal Veiga, Vibora, Havana, Cuba (July '38)

Grant, Burton S., Asst. Civ. Engr., Dept. of Water & Power, Box 3669 Terminal Annex, Los Angeles, Calif. (Oct. '34)

Grant, S. L., Supt., Water & Sewer Dept., Winchester, Va. (July '35)

Grant, W. K., Munic. Engr., Louisiana Fire Prevention Bureau, 609 Canal Bank Bldg., New Orleans, La. (May '25)

Grantham, Andrew S., Supt. Water Dept., Dobbs Ferry Rd., White Plains, N. Y. (Jan. '38)

Grantham, Hiram, Jr., Salesman, McEvoy Co., Houston, Tex. (Oct. '39)

Graves, Quintin B., Instructor in Civ. Eng., College of Eng., Univ. of Texas, Austin, Tex. (Apr. '39)

Gray, A. C., Gray Well & Pump Co., 854 Garfield St., Jacksonville, Fla. (Jan. '27)

Gray Chemical Co., The, E. W. Herr, Sales Mgr., Roulette, Pa. (Assoc. M. Apr. '40)

Gray, H. M., Technical Director, Cherry River Paper Co., 187 Riverside Drive, Richwood, W. Va. (Affil. Jan. '39)

Gray, Harold Farnsworth, San. & Hydr. Engr., 2540 Benvenue St., Berkeley, Calif. (Aug. '33)

Gray, Maxim T., Hagey & Gray Engineering Co., Box 134, Fort Erie, Ont., Can. (Apr. '38)

Gray, Samuel, Water Registrar, Montvale, N. J. (Oct. '35)

Grayson, L. W., Asst. Supt. & Engr., City Munic. Water Dept., 3854 Mulberry St., Riverside, Calif. (Oct. '37)

Great Falls, City of, Ed Henen, City Engr., Great Falls, Mont. (Corp. M. Jan. '25)

Great Western Electro-Chemical Co., 9 Main St., San Francisco, Calif. (Assoc. M. Sept. '29)

Greco, A. J., Supt., Riverton & Palmyra Water Co., 1 Morgan Ave., Palmyra, N. J. (Affil. Jan. '39)

Greeley, City of, M. Seaman, Water Supt., Greeley, Colo. (Corp. M. Apr. '26)

Greeley, Samuel A., Messrs. Greeley & Hansen, 6 N. Michigan Ave., Chicago, Ill. (July '07)

Green Bay Water Dept., James Church, Supt., Green Bay, Wis. (Corp. M. Nov. '14)

Green, Carl E., State San. Engr., 816 Oregon Bldg., Portland, Ore. (July '33)

Green, Charles B., Supt., Florence Township Water Works, 410 W. Front St., Florence, N. J. (Apr. '39)

Green, E. W., Vice-Pres. & Treas., San Jose Water Works, 374 W. Santa Clara St., San Jose, Calif. (Oct. '25)

Green, Fred, Sr. Chemist, Water Treatment Section, London & North Eastern Ry., Stratford, London, E. 15, England (Dec. '33)

Green, Harvey T., Asst. Civ. Engr., Bureau of Water Supply, 3406 Keene Ave., Baltimore, Md. (Jan. '40)

Green, Nelson B., Sales Mgr., Detroit Chemical Works, 125 S. Junction Ave., Detroit, Mich. (Jan. '38)

Green, Sterling S., Jr. Civ. Engr., Bureau of Water Works & Supply, Box 3669 Terminal Annex, Los Angeles, Calif. (Jan. '39)

Green, T. C., City Filtration Plant, Austin, Tex. (Apr. '25)

Greenberg's, M., Sons, Stuart N. Greenberg, 765 Folsom St., San Francisco, Calif. (Assoc. M. Sept. '24)

Greene, R. T., Clerk & Treas., Black Mountain, N. C. (Oct. '39)

Greenfield, R. E., Chemist, A. E. Staley Mfg. Co., Decatur, Ill. (Feb. '17)

Greenlee, J. L., Asst. Supt., Munic. Water Dept., Charlotte, N. C. (June '26)

Greenwood, Paul, Chief Engr., Water Works, Moorestown, N. J. (Oct. '38)

Greer, Willard N., Research Chemist, Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa. (Apr. '26)

Gregory, R. S., Supt., Munic. Water Dept., City Hall, Trinidad, Colo. (Jan. '40)

Gregory, Robert W., Foreman of Filter Plant, Proximity Print Works, 19 Upland Drive, Greensboro, N. C. (Apr. '39)

Gresham, Hill C., Gen. Mgr., *South West Water Works Journal*, Temple, Tex. (Oct. '39)

Grewe, Leo F., Supt., Munic. Light & Water Plant, Huntingburg, Ind. (Oct. '38)

Griffey, H. A., Mgr., Water Dept., City Hall, Janesville, Wis. (June '20)

Griffin, Attmore E., San. Engr., Wallace & Tiernan Co., Inc., Pompton Plains, N. J. (May '30)

Griffin Chemical Co., Richard G. Shaler, 1000 16th St., San Francisco, Calif. (Assoc. M. Oct. '38)

Griffin Light, Water & Sewerage Dept., H. P. Powell, Griffin, Ga. (Corp. M. Feb. '24)

Griffin, Walter C., Asst. Engr., Washington Suburban San. Dist., 34

Lincoln Ave., Takoma Park, Md. (Affil. July '38)

Griffith, D. H., *see* Inglewood Water Dept.

Griffiths, James G., Supt., Kensington Water Co., Box 143, New Kensington, Pa. (Oct. '24)

Grime, Edwin M., Engr. of Water Service, Northern Pacific Ry., St. Paul, Minn. (July '26)

Grimmer, Allan K., Town Engr., Canadian International Paper Co., Temiskaming, Que., Can. (June '20)

Grinnell Company, Inc., O. S. Thorne, Branch Mgr., P. O. Box 2229, Charlotte, N. C. (Assoc. M. May '23)

Grippen, Earle J., *see* Endicott Water Works Co.

Griswold, Harold W., Deputy Mgr. & Deputy Chief Engr., Water Bureau of Metropolitan Dist., 1026 Main St., Hartford, Conn. (Mar. '33)

Grobbel, Daniel Cornelius, 2617 Montclair St., Detroit, Mich. (Oct. '20)

Grodin, Bernard, Chem. Engr., Fuel Economy Engineering Co., 510 New York Bldg., St. Paul, Minn. (Apr. '39)

Groner, E. C., Installation Engr., Sloan Valve Co., 4300 W. Lake St., Chicago, Ill. (Oct. '23)

Grooms, James W., Supt. of Water, 14 E. Harrison St., Saratoga Springs, N. Y. (Jan. '36)

Gross, Dwight D., Chief Engr., Board of Water Comrs., Box 629, Denver, Colo. (July '25)

Grove, Herbert S., Engr. & Supt., Board of Water Comrs., 20 N. 3rd St., Stillwater, Minn. (Oct. '37)

Groves, J. N., Supt., Water Works, Canton, Ga. (May '30)

Grubb, Elmer K., Mgr., Pottstown Gas & Water Co., R. D. 3, Pottstown, Pa. (Jan. '37)

Gruetzmacher, Clarence S., Engr. of Distr., Milwaukee Water Works, 401 City Hall, Milwaukee, Wis. (June '20)

Guatemala City Cia del Agua del Mariscal, S. A., Otto Roberto Dorion, Commercial & Technical Mgr., Guatemala City, Guatemala (Corp. M. Jan. '36)

Gude, George E., Jr., Mgr. of Sales, Wyatt Metal & Boiler Works, Houston, Tex. (Oct. '39)

Guelph, City of, H. S. Nicklin, City Engr., City Hall, Guelph, Ont., Can. (Corp. M. Mar. '24)

Guenther, C. E., *see* Salem Water Com.

Guerrero, Luis Lobo, San. & Civ. Engr., Apartado No. 409, Bogota, Colombia, S. A. (Jan. '35)

Guhin, Frank E., Water Comr., Aberdeen, S. D. (Apr. '40)

Guillot, A. H., Roadway Engr., New Orleans Public Service, Inc., 317 Baronne St., New Orleans, La. (July '37)

Gulden, Horace B., Mgr., State College Water Works, Alpha Five Hall, State College, Pa. (Jan. '40)

Gunderson, N. E., Pres., Layne Northern Co., Mishawaka, Ind. (July '37)

Gunter, Herman, State Geologist, P. O. Box 495, Tallahassee, Fla. (May '28)

Gurley, W. & L. E., H. M. Dibert, 514 Fulton St., Troy, N. Y. (Assoc. M. Apr. '19)

Guthrie, John T., Mgr.-Treas., Signal Mt. Estates, Inc., Signal Mt., Tenn. (Apr. '37)

Gutsch, A. C., Supt., City Water Works, Washington, Ind. (Jan. '39)

Gutting, L. A., Mgr., Public Service Co. of Indiana, Shelbyville, Ind. (Jan. '38)

Haas, Frank S., Secy., City Water Works, Council Bluffs, Iowa (July '35)

Haas, S. G. Frank, Technical Engr., Sewerage & Water Board, New Orleans, La. (Oct. '33)

Haberer, H. N., *see* Adirondack Water Works

Hacker, A. C., Vice-Pres., Hacker Pipe & Supply Co., 1725 E. Seventh St., Los Angeles, Calif. (Oct. '29)

Haddonfield Borough Water Dept., J. Ross Logan, Clerk, Borough of Haddonfield, N. J. (Corp. M. Apr. '40)

Haering, David W., 3408 W. Monroe St., Chicago, Ill. (Apr. '36)

Hagar, Major C., Supt., Boonville Water Dept., P. O. Box 178, Boonville, Mo. (Apr. '39)

Hagins, C. E., Asst. to Gen. Mgr., Water Dept., 805 Franklin St., Johnstown, Pa. (Sept. '26)

Hahn, Harry J., Water Works Supt., Grafton, Ohio (Affil. Jan. '40)

Hail, J. J., Supt., Water Dept., City Hall, Dubuque, Iowa (Oct. '38)

Haiss, Carl E. J., San. Engr., Water Power & Control Com., State Office Bldg., 80 Center St., New York, N. Y. (Oct. '37)

Hale, Frank E., Director of Labs., Mt. Prospect Lab., 355 Park Pl., Brooklyn, N. Y. (May '08) *Goodell Prize '35.*

Hale, Harrison, Head of Chemistry Dept., Univ. of Arkansas, Fayetteville, Ark. (Jan. '40)

Hall, G. Albro, San. Engr. & Supervising Chemist, Floyd G. Browne, Box 134, Marion, Ohio (July '38)

Hall, G. D., Engr., 416 A. E. Larson Bldg., Yakima, Wash. (Jan. '36)

Hall, George Laird, Ambassador Apts., Baltimore, Md. (Oct. '37)

Hall, H. F., Chief Engr., Water Works Dept., Northern Apts., Sarnia, Ont., Can. (June '20)

Hall, H. G., Supt., Public Utilities Com., Ingersol, Ont., Can., (Mar. '23)

Hall, Harry R., Chief Engr., Washington Suburban San. Dist., Hyattsville, Md. (May '15)

Hall, John D., Supt. of Water Dept., Drawer 149, Waverly, N. Y. (Oct. '37)

Hall, John W., Fort Shaw, Mont. (May '25)

Hall, Jos. M., *see* Camden County Vocational School

Hall, Richard F., Supt., West Virginia Water Service Co., East Rainelle, W. Va. (Affil. Jan. '39)

Hall, Rodney D., Mgr., Waterworks Div., Worthington Pump & Machinery Corp., Harrison, N. J. (Oct. '34)

Hall, Roland B., Burford, Hall, Smith, Contractors, 705 Myrtle St., N. E., Atlanta, Ga. (Sept. '25)

Hall, W. H., Prof. Civ. Eng., College Station, Durham, N. C. (Jan. '30)

Hallam, G. C., Water Supt., P. O. Box 204, Orofino, Idaho (June '33)

Hallam, James P., Chief Engr., Manchester Corp. Water Works, Town Hall, Manchester, England (July '39)

Hallgren, E. N., Dist. Mgr., Rensselaer Valve Co., 1252 First Ave., S., Seattle, Wash. (Dec. '29)

Hallgren, R. A., Supt. of Water Dept., Crystal Beach, Ont., Can. (Apr. '34)

Halloway, E. L., *see* Flint Water Dept.

Halpin, Anthony F., Asst. Chemist, 787 Lake St., Newark, N. J. (July '39)

Halpin, Henry E., Fire Protection Engr., Inspection Dept., Factory Mutual Fire Insurance Cos., 184 High St., Boston, Mass. (Jan. '30)

Halpin, Thomas F., A. P. Smith Mfg. Co., East Orange, N. J. (July '01)

Hälsingborg City Water Dept., Georg Hentz, Chief Engr., Vattenverket, Hälsingborg, Sweden (Corp. M. Jan. '38)

Ham, George C., Secy. & Gen. Mgr., Naugatuck Water Co., 250 Meadow St., Naugatuck, Conn. (May '30)

Ham, John, Water Mgr., Brisbane Water Co., Brisbane, Calif. (Oct. '38)

Hamilton, Bruce, Mgr., Hamilton Heath Water Co., 2910 Aquilla St., Tampa, Fla. (Jan. '36)

Hamilton, John, 5838 N. Albina Ave., Portland, Ore. (Nov. '29)

Hamilton, Louis H., Secy. & Gen. Mgr., Walnut Park Mutual Water Co., 7216 S. Seville Ave., Huntington Park, Calif. (July '36)

Hamilton, S. C., Dist. Sales Mgr., Chicago Bridge & Iron Co., Box 277, Birmingham, Ala. (Jan. '36)

Hamler, Bruce, Supt. of Water Works, City Hall, Rome, Ga. (Apr. '40)

Hammel, C. W., Water Plant Operator, Sistersville Water Works, 213 Railroad Ave., Sistersville, W. Va. (Affil. Jan. '39)

Hammerschmidt, E. G., Chief Chemist, Texoma Natural Gas Co., Fritch, Tex. (Jan. '39)

Hammes, J. Allan, *see* Sheboygan Board of Water Comrs.

Hammond, W. H., Supt., Lindsay Water Works, Lindsay, Ont., Can. (June '14)

Hampton, L. B., Dist. Mgr., Crane Co., Box 3617, Portland, Ore. (July '40)

Hanes, J. C., Asst. Prof., Civ. Eng., Virginia Military Institute, 5 University Pl., Lexington, Va. (July '39)

Haney, Paul D., Chem. Engr., Kansas State Board of Health, Room 2, Marvin Hall, Kansas Univ., Lawrence, Kan. (Jan. '39)

Hanks, C. W., Supt., Water Works Const., 1720 California St., Denver, Colo. (Aug. '33)

Hanks, Fred W., Co., Fred W. Hanks, Mgr., 10624 St. Clair Ave., Cleveland, Ohio (Assoc. M. June '26)

Hanks, O. P., Sales Repr., Hersey Manufacturing Co., P. O. Box 113, Trenton, N. J. (Oct. '35)

Hanlon, T. W., Jr., Southwestern Sales Agent, U. S. Pipe & Foundry Co., 1204 Praetorian Bldg., Dallas, Tex. (Oct. '39)

Hanna, David McLean, Supt. of Distr., 1121 Pelissier St., Windsor, Ont., Can. (June '20)

Hanna, John E., Supt., Water Works, 202 E. Market St., Cadiz, Ohio (Jan. '40)

Hanna, R. B., Supt., Public Utilities Com., Listowel, Ont., Can. (Apr. '31)

Hannan, Frank, 285 Willow Ave., Toronto, 8, Ont., Can. (July '21)

Hanning, B. E., Water Comr., Water Dept., City Hall, Bellingham, Wash. (Affil. Apr. '40)

Hanning, T. L., Pres., Steel Tank & Pipe Co. of Oregon, P. O. Box 1898, Station F, Portland, Ore. (Oct. '39)

Hannum, V. W., Supt., Water Dept., 518 S. Los Angeles St., Anaheim, Calif. (July '35)

Hansell, Wm. A., Asst. Chief of Const., City Hall, Atlanta, Ga. (Oct. '33)

Hansen, A. E., Cons. San. & Hydr. Engr., 415 Lexington Ave., New York, N. Y. (Dec. '17)

Hansen, A. H., *see* Hibbing Water, Light, Power & Building Com.

Hansen, Paul, Greeley & Hansen, 6 N. Michigan Ave., Chicago, Ill. (June '12)

Hanson, Arthur, *see* Neenah City Water Works

Hanson, Harold A., Box 99, Grand Rapids, Minn. (July '35)

Hapgood, Frederic H., Hydr. Engr., 8538—168th Pl., Jamaica, N. Y. (Jan. '39)

Hapgood, Joseph C., Inspector, Warren Water Dept., 344 Oak Knoll, S. E., Warren, Ohio (Oct. '35)

Hardesty, J. Paul, Asst. Supt., Board of Trustees of Public Affairs, 215 S. Marietta St., St. Clairsville, Ohio (Apr. '40)

Hardin, Eugene A., 202 Edgecliff Drive, Highland Park, Ill. (Nov. '25)

Harding, Fred W., Plant Supt., Okemah Water Works, R. No. 4, Okemah, Okla. (Apr. '36)

Harding, Jack E., Willows, Miss. (Apr. '40)

Harding, James C., Cons. Engr., 19 E. Main St., Mt. Kisco, N. Y. (June '22)

Harding, Robert W., Mgr. & Pres., Bexar County Water Co., South San Antonio, Tex. (Oct. '35)

Hargett, Albert E., Ford Meter Box Co., 874—10th St., Box 624, Bowling Green, Ky. (Mar. '29)

Harlamert, Paul A., 1530 Builders Exchange Bldg., Cleveland, Ohio (July '35)

Harlan Munic. Water Works, C. H. Franklin, Mgr., Harlan, Ky. (Corp. M. Apr. '38)

Harland, Robert O., Acct., Fresno City Water Dept., P. O. Box 1274, Fresno, Calif. (Oct. '38)

Harley, Frank E., Civ. Engr., Fairlawn-Radburn Trust Co. Bldg., Fairlawn, N. J. (Jan. '36)

Harlock, C. R., Jr. Officer, U. S. Dept. of Justice, Lock Box 250, Steilacoom, Wash. (July '38)

Harman, Asher W., *see* Bristol, City of

Harman, W. B., Auditor, Newport News Waterworks Com., Newport News, Va. (July '34)

Harmon, Burt, Hydr. Engr., Water Dept., 400 Public Utilities Bldg., Long Beach, Calif. (Oct. '32)

Harmon, Judson A., San. Engr., State Dept. of Health, State Bldg., Los Angeles, Calif. (Sept. '31)

Harmonay, Michael J., Supt., Bureau of Water, City Hall, Yonkers, N. Y. (Aug. '32)

Harness, A. C., Town Clerk & Water Supt., Brush, Colo. (Oct. '37)

Harnish, C. P., Chief Engr., Southern California Water Co., 950 Bendix Bldg., 1206 S. Maple Ave., Los Angeles, Calif. (Aug. '29)

Harper, L. E., Secy., Omega Machine Co., 4010 Pennsylvania Ave., Kansas City, Mo. (July '37)

Harrell, H. O., Water Supt., El Reno, Okla. (Oct. '39)

Harrington, John B., Director, Div. of San. Eng., State Dept. of Health, Charleston, W. Va. (July '38) *Director '41–'43.*

Harrington, John H., Chemist, Montreal Filtration Works, 3355 Joseph St., Verdun, Que., Can. (Jan. '37)

Harris, A. P., Supt., Edwardsville Water Co., Edwardsville, Ill. (Apr. '36)

Harris, H. H., Engr. & Water Supt., Palisades Del Rey Water Co., 427 Moscow St., Venice, Calif. (Oct. '38)

Harris, Howard A., Asst. Engr., California Water Service Co., P. O. Box 1150, San Jose, Calif. (Aug. '27)

Harris, J. C., Water Supt., Electra, Tex. (Oct. '39)

Harris, John P., Industrial Chemical Sales Div., West Virginia Pulp & Paper Co., 35 E. Wacker Drive, Chicago, Ill. (Oct. '33)

Harris, R. C., *see* Toronto Dept. of Works

Harris, Robert R., 127 N. 44th St., Louisville, Ky. (Jan. '36)

Harris, Roy M., Chief, Div. of Public Health Eng., State Dept. of Health, 1412 Smith Tower, Seattle, Wash. (Jan. '35)

Harrison, Cecil H., Chief Engr., City Water Dept., P. O. Box 122, Enid, Okla. (Oct. '39)

Harrison, Louis B., Supt. of Filtration, Bay City Water Works Dept., Bay City, Mich. (Feb. '31)

Harrison, Ronald, *see* Scarborough Public Utilities Com.

Harritt, Chester, Chief Engr. & Gen. Mgr., 4769 Spring St., La Mesa, Calif. (Oct. '37)

Hart, Charles G., 423 Durston Ave., Syracuse, N. Y. (Jan. '39)

Hartmann, F. W., National Meter Co., 1455 W. Congress St., Chicago, Ill. (July '25)

Hartsook, L. P., Ashland, Va. (Jan. '37)

Hartum, R. A., Engr., 130 S. Hill Rd., Ridgewood, N. J. (Affil. Jan. '39)

Hartung, H. O., Chemist, St. Louis County Water Co., 6600 Delmar Blvd., University City, St. Louis, Mo. (July '38)

Harvey, J. R., Asst. Engr., Pennsylvania Dept. of Health, 609 Trust Bldg., Meadville, Pa. (Affil. July '39)

Harvey, Lee, Supt. & Chief Operator, Water Works Dept., 236 Liberty St., Conneaut, Ohio (Jan. '40)

Hasbrouck, Philip B., Engr., Fontana Domestic Water Co., Box 294, Fontana, Calif. (May '30)

Haskew, George M., Engr. & Supt., Plainfield-Union Water Co., 26 E. Broad St., Westfield, N. J. (July '29)

Haskins, Charles A., Cons. Engr., 517 Finance Bldg., Kansas City, Mo. (June '14)

Hassler, John W., Director of Research, Industrial Chemical Sales Div., West Virginia Pulp & Paper Co., 4 Hillcrest, Tyrone, Pa. (Jan. '37)

Hastings, Board of Public Works, Ray Coffey, Supt., Water & Light Dept., Hastings, Neb. (Corp. M. Jan. '36)

Hatch, Aram H., P. O. Box 793, Balboa, Canal Zone (Aug. '27)

Hatfield, William Durrell, Sewage Disposal Plant, San. Dist. of Decatur, Decatur, Ill. (Jan. '17)

Hausmann, A. R., Asst. Pacific Coast Mgr., U. S. Pipe & Foundry Co., 681 Market St., San Francisco, Calif. (Aug. '33)

Havens, William L., George B. Gascoigne & Assoc., Leader Bldg., Cleveland, Ohio (June '26)

Havill, Harold T., Civ. Engr., White Plains State Rd., Box 323, Valhalla, N. Y. (June '02)

Hawaiian Pineapple Co., Ltd., E. F. Cornell, Asst. Plant Mgr., Honolulu, T.H. (Corp. M. Apr. '38)

Hawken, Frank S., Sr. Chem. Engr., 3954 Greer Ave., St. Louis, Mo. (Jan. '35)

Hawkins, J. L., Supt., Greenville City Water Works, Greenville, S. C. (Jan. '36)

Hawley, George W., Deputy State Engr. in Charge of Supervision of Dams, 1100 N St., Sacramento, Calif. (June '22)

Hawley, John B., Cons. Engr., 407 Capps Bldg., Fort Worth, Tex. (June '23)

Haydock, Charles, Cons. Engr., Commercial Trust Bldg., Philadelphia, Pa. (Feb. '19)

Hayes, H. W., Supt. of Water Works, Lawrenceville, Va. (July '34)

Hayes, Harry, Jr. Civ. Engr., Field Eng. Investigations, Dept. of Water & Power, Box 3669 Terminal Annex, Los Angeles, Calif. (Feb. '33) *Goodell Prize '37.*

Hayes, W. J., Resident Engr., Meridian Farms Water Co., Meridian, Sutter Co., Calif. (Oct. '39)

Hayman, Michael & Co., Inc., Arthur H. Rosenbaum, 856 E. Ferry St., Buffalo, N. Y. (Assoc. M. Oct. '35)

Haynes, Hugh P., 711½ W. Roma St., Albuquerque, N. M. (Apr. '40)

Haynes, Lawson, Plant Supt., West Virginia Water Service Co., 715 Indiana Ave., Charleston, W. Va. (Oct. '39)

Hays Manufacturing Co., W. R. Johnson, 12th & Liberty Sts., Erie, Pa. (Assoc. M. Mar. '82)

Haywood, R. W., Jr., 748 Public Ledger Bldg., Philadelphia, Pa. (Jan. '37)

Hazen, John B., General Foreman, Butte Water Co., Butte, Mont. (Apr. '38)

Hazen, Ray, Supt., Willapa Valley Water Dist., Menlo, Wash. (Affil. Jan. '40)

Hazen, Richard, % Malcolm Pirnie, 25 W. 43rd St., New York, N. Y. (July '37)

Hazlehurst, George H., Director, Bureau of Sanitation, State Dept. of Public Health, Montgomery, Ala. (Nov. '14)

Healdsburg, City of, Archer B. Stuart, Water Supt., City Hall, Healdsburg, Calif. (Corp. M. Oct. '37)

Heath, A. E., Foreman, City Water Dept., Billings, Mont. (Apr. '40)

Heath, Raymond F., Chief Chemist, Dept. of Public Health, City Hall, Toronto 2, Ont., Can. (June '24)

Hechmer, Carl A., Dept. Engr., Maintenance & Operating Dept., Washington Suburban San. Dist., Hyattsville, Md. (Nov. '19) *Fuller Award '40.*

Heck, Robert L., Supt., Munic. Filter Plant, Pittsburg, Calif. (Oct. '37)

Heddell, Douglas, 227 Filbert St., San Francisco, Calif. (Oct. '33)

Hedgepeth, L. L., Mgr., Technical Service Dept., Pennsylvania Salt Mfg. Co., 1000 Widener Bldg., Philadelphia, Pa. (Aug. '29)

Hedman, O. F., Salesman, Hughes & Co., Box 193, Spokane, Wash. (June '34)

Heermans, H. C., 817 J St., Hoquiam, Wash. (June '86)

Heider, Robert W., Asst. Engr., Indiana State Board of Health, 1098 W. Michigan St., Indianapolis, Ind. (July '37)

Heighes, George, Water Supt., Redmond, Ore. (Affil. Jan. '40)

Heine, Francis A., Chief Engr., Bureau of Water, City Hall, Reading, Pa. (June '31)

Helbig, W. A., Asst. Engr., Darco Corp., Sales Div., 60 E. 42nd St., New York, N. Y. (Feb. '30)

Helena, City of, A. J. Roberts, Mayor, Helena, Mont. (Corp. M. Jan. '37)

Helland, H. R. F., Cons. Engr., Frost National Bank Bldg., San Antonio, Tex. (Jan. '35)

Helling, Harry A., 116 S. Broadway, Tarrytown, N. Y. (Jan. '22)

Hellstrom, Carl I., Supt., Water & Light Dept., Geneva, Ill. (Mar. '33)

Helmreich, L. W., Pres. & Mgr., Capital City Water Co., Box 806, Jefferson City, Mo. (Feb. '27)

Helwick, Chas. H., Gen. Foreman of Distr., Water Dept., Utilities Bldg., Jacksonville, Fla. (Jan. '40)

Hemborg, R. E. Civ. Engr., Bureau of Water Works & Supply, Vesper Ave. & Aetna St., Van Nuys, Calif. (Apr. '37).

Hempstead, Inc. Village of, W. L. King, Chief Operator, Munic. Water Plant, 318 Fulton Ave., Hempstead, N. Y. (Corp. M. Jan. '40)

Henderlite, J. H., City Chemist, Gastonia, N. C. (Jan. '36)

Henderson, Angus D., Transitman, 210-07—29th Ave., Bayside, L. I., N. Y. (Jan. '37)

Henderson, Charles R., 39 N. Fullerton Ave., Montclair, N. J. (June '01) *Vice-Pres. '08, '13. Exec. Com. '09-'12, '20-'21. Trustee, '14-'16. President '19. Honorary M. '36.*

Henderson, M. E., *see* Bozeman, City of

Hendrick, Wallace M., Contractor & Engr., 457 Franklin Ave., Mineola, L. I., N. Y. (May '15)

Hendricks, R. W., Engr. Hydr. Dept., Underwriters Labs., 207 E. Ohio St., Chicago, Ill. (Apr. '23)

Hendrickson, Geo. L., Asst. Mng. Engr., Bureau of Water, City County Bldg., Pittsburgh, Pa. (Mar. '31)

Hendrie & Bolthoff Mfg. & Supply Co., James S. Smith, 1635 Seventeenth St., Denver, Colo. (Assoc. M. Mar. '26)

Hendrix, Dave A., Local Mgr., California Water Service Co., P. O. Box 31, Willows, Calif. (Oct. '39)

Hendrix, Thomas L., Jr., Asst. Chemist, Chesapeake & Ohio Ry. Co., 104 W. 2nd St., Peru, Ind. (Apr. '40)

Henen, Ed., *see* Great Falls, City of

Henke, Roland, Supt., Water Works, 7300 Blanchard St., Wauwatosa, Wis. (Jan. '35)

Henley, M. E., Sales Engr., Wallace & Tiernan Co., Inc., 482 Seminole Ave., N. E., Atlanta, Ga. (July '39)

Henley, Thomas B., 1410 Baldwin Ave., P. O. Box 101, Rosemead, Calif. (Oct. '38)

Henning, Edwin C., *see* Evansville Dept. of Water Works

Henning, H. Clay, Engr. in Charge, Operating Section, St. Louis Water Div., 1640 S. Kingshighway Blvd., St. Louis, Mo. (Feb. '30)

Henry, Clarence R., Water Treatment Technician, Munic. Water Works, 2386 S. W. 5th St., Miami, Fla. (Apr. '40)

Henry, Francis Wm., Supt., Phelps Water Works, 131 W. Main St., Phelps, N. Y. (Apr. '38)

Henry, J. Rex, Dept. of Utilities, 734 N. Park Ave., Fremont, Neb. (Aug. '32)

Henry, T. B., Cons. Engr., 2012—2nd National Bank Bldg., Toledo, Ohio (Jan. '39)

Henshaw, Franklin, 56 Walwoeth Ave., Scarsdale, N. Y. (Sept. '20)

Hentz, Georg, *see* Hälsingborg City Water Dept.

Herberg, Sanford, *see* Fire Underwriters Inspection Bureau

Herbert, E. H., Asst. Engr., Div. of Water Supply, Norfolk, Va. (Jan. '38)

Hernandez, Juan A., Engr. of Secretaria Sanidad & Salubridad Publica, Instituto Finlay, Infanta y Zaldo, Havana, Cuba (July '38)

Herr, J. O., Mgr., Monmouth Consolidated Water Co., Long Branch, N. J. (June '16)

Herring, F. W., Exec. Director, American Public Works Assn., 1313 E. 60th St., Chicago, Ill. (Jan. '30)

Herring, Jos. E., Chief Foreman, Water Dept., Utilities Bldg., Jacksonville, Fla. (Jan. '40)

Herron, William L., 22 Fairview Ave., Hudson, N. Y. (Oct. '37)

Hersey Mfg. Co., South Boston, Mass. (Assoc. M. July '87)

Hersey, T. Schuyler, Pres., Hersey Inspection Bureau, 4069 Hollis St., Oakland, Calif. (Jan. '40)

Hertel, J. F., Secy.-Treas., Public Utilities Com., 22 Queen St., N., Waterloo, Ont., Can. (Jan. '40)

Heselden, E. C., Sutp., Water & Light Dept., Georgetown, S. C. (Oct. '39)

Hetzer, Mentor, Moundsville Water Co., 506 Seventh St., Moundsville, W. Va. (Nov. '16) *Director '39-'40.*

Heubi, Thomas B., Supt. of Water Works, 45 Washington Ave., Fredonia, N. Y. (Apr. '30)

Hewett, Arthur L., Supt., Water Dept., 109 N. 27th St., Billings, Mont. (Mar. '32)

Heyward, T. C., Mech. & Elec. Engr., 1408 Independence Bldg., Charlotte, N. C. (June '23)

Hibbing Water, Light, Power & Building Com., A. H. Hansen, Chief Engr., Hibbing, Minn. (Corp. M. July '34)

Hibbs, A. S., 32 W. 2nd St., Chillicothe, Ohio (Sept. '22)

Hibschle, W. E., Supt., Leadville Water Co., 719 Harrison Ave., Leadville, Colo. (Jan. '39)

Hickcox, R. M., Water Supt., Water Shop, Wenatchee, Wash. (Apr. '38)

Hickery, John A., Director of Public Utilities, City Hall, Cleveland, Ohio (Apr. '40)

Hicklin, Robert G., Mgr., Munic. Dept., Robert & Co., Inc., 706 Bona-Allen Bldg., Atlanta, Ga. (Apr. '29)

Hickory, City of, R. E. Smyre, Hickory, N. C. (Corp. M. Nov. '33)

Hicks, A. F., *see* Palm Springs Water Co.

Hicks, W. F., City Engr., Paris, Tex. (Jan. '35)

Hicksville Water Dist., Frederick R. Davidson, 85 Bethpage Rd., Hicksville, N. Y. (Corp. M. Oct. '34)

Higgins, Roger C., Chief Chemist, Chillicothe Munic. Utilities, Chillicothe, Mo. (Jan. '37)

Highland, Scotland G., Secy., Treas., Gen. Mgr., & Sr. Engr., Clarksburg Water Board, Clarksburg, W. Va. (Feb. '13)

Hileman, H. L., Mgr., Cairo Water Co., 618 Commercial Ave., Cairo, Ill. (Jan. '40)

Hill, Alfred H., Vice-Pres., Francis Hankin & Co., Ltd., 2028 Union Ave., Montreal, Que., Can. (Feb. '33)

Hill, Frank C., Water Supt., Box 155, Montrose, Colo. (Jan. '37)

Hill, Kenneth V., Asst. Engr., Greeley & Hansen, 6 N. Michigan Ave., Chicago, Ill. (Jan. '37)

Hill, Raymond A., Cons. Civ. Engr., Engrs. Consolidated, 905 Edison Bldg., 601 W. Fifth St., Los Angeles, Calif. (Feb. '32)

Hill, W. R., Cons. Civ. Engr., Parker & Hill, 2021 Smith Tower, Seattle, Wash. (Apr. '39)

Hillsborough Water Dept., E. P. Wilsey, City Mgr., 705 El Camino Real, Burlingame, Calif. (Corp. M. Apr. '39)

Hillside Distribution Co., R. E. Launer, 2603 E. Whittier Blvd., Whittier, Calif. (Corp. M. Oct. '30)

Hilton, Harry, Supt., Water Dept., Cordell, Okla. (Oct. '39)

Hinds, Julian, Asst. Chief Engr., Metropolitan Water Dist., 306 W. Third St., Los Angeles, Calif. (May '31)

Hines, Fred J., Gen. Contractor, 2750 Monroe Ave., Rochester, N. Y. (Apr. '40)

Hinman, E. S., Director, York County Dairy Labs., Spring Grove, Pa. (Apr. '37)

Hinman, Jack J., Jr., Assoc. Prof. of Sanitation, Univ. of Iowa, P. O. Box 363, Iowa City, Iowa (Apr. '15) *Trustee '19-'21. Vice-Pres. '29. President '30. Director '31.*

Hintz, Albert E., Jr., Mgr., Water Dept., City Hall, Oshkosh, Wis. (Apr. '30)

Hinyard, J. N., Chem. Engr., Water & Sewerage Dept., El Paso, Tex. (Oct. '38)

Hirn, W. C., San. Engr., 532 Michigan Bldg., Detroit, Mich. (Jan. '38)

Hitchman, Arthur, Asst. Supt., Water Distr. Section, Dept. of Works, 33 Hillsdale Ave., W., Toronto, Ont., Can. (Sept. '29)

Hoad, William Christian, 2108 Melrose Ave., Ann Arbor, Mich. (June '13)

Hoag, Edgar D., Gen. Foreman, Los Angeles Dept. of Water & Power, 703 S. Main St., Lone Pine, Calif. (Oct. '34)

Hoag, Geo. F., Engr., Suburban Div., New York Fire Insurance Rating Organization, 85 John St., New York, N. Y. (June '20)

Hoak, Richard D., 249½ N. Queen St., Apt. 4, Lancaster, Pa. (Jan. '37)

Hobby, Arthur S., Cons. Engr., 605 Broad St., Newark, N. J. (Jan. '37)

Hochlerner, Tobias, Asst. Engr., Dept. of Water Supply, Gas & Electricity, Municipal Bldg., New York, N. Y. (May '30)

Hodge, W. W., Prof., Dept. of Chem. Eng., West Virginia Univ., Morgantown, W. Va. (Jan. '39)

Hodges, Fred J., *see* California Water & Telephone Co.

Hodges, George C., Pres., Consolidated Water Co., 712 Washington St., Utica, N. Y. (June '24)

Hodkinson, Thomas, Supt. of Water Works, 382 Wortley Rd., London, Ont., Can. (Apr. '13)

Hoefle, K. F., Distr. Engr., Municipal Bldg., Dallas, Tex. (Apr. '40)

Hoefling, William L., Sales Mgr., General Chemical Co., 1 W. Genesee St., Buffalo, N. Y. (Apr. '37)

Hoen, C., Gen. Supt., Carthage Water & Elec. Plant, Carthage, Mo. (July '35)

Hoffer, H. A., Asst. Gen. Sales Mgr., U. S. Pipe & Foundry Co., General Office, Burlington, N. J. (May '30)

Hoffman, Floyd A., 1270 Broadway, New York, N. Y. (July '26)

Hoffman, Frank A., Dist. Supt., Maplewood, Ore. (July '34)

Hoffman, L. J., Office Mgr., Akron City Water Works, 100 Municipal Bldg., Akron, Ohio (Apr. '39)

Hoffman, M. F., Commercial Supt., Dept. of Water Works, 142 City Hall, Cincinnati, Ohio (Oct. '34)

Hoffman, Philip R., Water Chemist, Dept. of Water and Power, Box 3669 Terminal Annex, Los Angeles, Calif. (Apr. '40)

Holaday, K. M., Chem. Engr., Anheuser-Busch, Inc., 721 Pestallozzi St., St. Louis, Mo. (Jan. '40)

Holden, Joseph W., Chief Engr., Board of Water Comrs., New Britain, Conn. (July '37)

Holding, Willis A., Chemist, Water Dept., P. O. Box 333, Raleigh, N. C. (Oct. '36)

Holland, Paul L., Chief Engr., Public Service Com. of Maryland, 1701 Munsey Bldg., Baltimore, Md. (Mar. '32)

Holland Water Dist. No. 1, Clair D. Tanner, Supt. of Water, Holland, N. Y. (Corp. M. Apr. '37)

Hollander, Harry, Asst. Engr., Dept. of Water Supply, Gas & Electricity, 2532 Municipal Bldg., New York, N. Y. (May '30)

Hollister Water Co., A. W. Holsworth, Supt., 314 West, Hollister, Calif. (Corp. M. Nov. '33)

Holman, E. T., Chief Inspector, Tennessee Inspection Bureau, 1034 Stahlman Bldg., Nashville, Tenn. (Jan. '24)

Holmes, Alfred Philip Hanby, Water Engr., Municipality, Penang, Straits Settlements (Apr. '38)

Holmes, Harry A., Eddy Valve Co., 111 Claremont Rd., Ridgewood, N. J. (Jan. '36)

Holmes, Joseph A., Director of Service, National Aluminate Corp., 6216 W. 66th Pl., Chicago, Ill. (May '26)

Holmquist, C. A., Director, Div. of Sanitation, State Dept. of Health, State Office Bldg., Albany, N. Y. (Apr. '23)

Holst, J. E., Supt. & Chemist, Water Dept., City Hall, Mitchell, S. D. (Oct. '38)

Holste, Alexander, Drateln & Holste Sucr., 2A V. Carranza 48, P. O. Box 438, Mexico City, Mexico (May '34)

Holsworth, A. W., *see* Hollister Water Co.

Holton, Douglas W., Supt., Water Dept., Washington, D. C. (May '30)

Holton, Philip P., *see* Providence Dept. of Public Works

Holway, W. R., Cons. Hydr. Engr., 302 E. 18th St., Tulsa, Okla. (Feb. '25)

Homelite Corp., Nelson Thompson, Riverdale Ave., Port Chester, N. Y. (Assoc. M. Apr. '36)

Hommon, Harry B., Sr. San. Engr. in Charge, U. S. Public Health Service, Federal Office Bldg., San Francisco, Calif. (July '21)

Honolulu Board of Water Supply, Frederick Ohrt, Mgr., City & County of Honolulu, P. O. Box 3347, Honolulu, T. H. (Corp. M. Nov. '30)

Hooker, Albert H., Jr., Hooker Electrochemical Co., Tacoma, Wash. (July '30)

Hooker Electrochemical Co., G. F. Reale, Niagara Falls, N. Y. (Assoc. M. July '20)

Hooker, L. J., Supt., of Water Works, City Bldg., Pine St., Lockport, N. Y. (Mar. '31)

Hooper, Frederick J., Clerk & Treas., Kenora, Ont., Can. (Jan. '37)

Hoot, Ralph A., Chief Chemist, Fort Wayne Water Works, Fort Wayne, Ind. (Mar. '26)

Hoover, Charles P., Chemist, Filtration Plant, Columbus, Ohio (May '13)

Hoover, Ira M., Supt., Montepelier Waterworks, Montpelier, Ohio (Apr. '39)

Hopkin, W. Howard, Field Repr., Self Liquidating Div., Reconstruction Finance, Lincoln Bank Bldg., Louisville, Ky. (Jan. '40)

Hopkins, E. W., City Engr., City Hall, Salina, Kan. (Jan. '37)

Hopkins, Edward S., Filtration Engr., Montebello Filters, Baltimore, Md. (June '21)

Hopkins, Edwin W., 712 Washington St., Utica, N. Y. (Aug. '25)

Hopkins, O. C., P. A. San. Engr., U. S. Public Health Service, 1413 Park Rd., N.W., Washington, D. C. (Jan. '37)

Hopper, Allen O., Dist. Mgr., Turbine Equipment Co., 217 East Ave., Rochester, N. Y. (Apr. '37)

Horan, John J., Supt., Delaware River Water Co., Beverly, N. J. (Jan. '30)

Horandt, Henry, Mgr., New York Water Service Corp., 2015 Church Ave., Brooklyn, N. Y. (June '29)

Horn, A. John, San. Engr., Pease Labs., 39 W. 38th St., New York, N. Y. (July '39)

Horne, Ralph W., Fay, Spofford & Thorndike, Cons. Engrs., 11 Beacon St., Boston, Mass. (May '28)

Horner, Charles M., Supt., Water Works Co., 1705 State St., East St. Louis, Ill. (June '03)

Horner, J. L., Supt., Water Dept., Henderson, Tex. (Oct. '39)

Hornshaw, James E., Asst. Civ. Engr., 13376 Hubbell Ave., Detroit, Mich. (July '38)

Horsington, Earl, Supt. of Water, Skaneateles, N. Y. (July '35)

Horstmann, F. B., Chem. Engr., 1005 N. Leamington Ave., Chicago, Ill. (June '27)

Horstman, Herman G., Supt. of Water Distr., Public Service Co. of Indiana, Traction Terminal Bldg., Indianapolis, Ind. (Jan. '37)

Horton, Robert E., Hydr. Engr., R. D. 1, Voorheesville, N. Y. (Jan. '11)

Horton, Roland, Munic. & San. Engr., 745 Atlanta Ave., Webster Groves P. O., St. Louis, Mo. (Apr. '36)

Horton, Theodore, Sandwich, Cape Cod, Mass. (July '07)

Hoshall, Robert H., Cons. Engr., 65 McCall Pl., Memphis, Tenn. (Apr. '37)

Hoskins, J. K., Sr. San. Engr., U. S. Public Health Service, Third & Kilgour Sts., Cincinnati, Ohio (July '35)

Hoskinson, Carl M., Chief Engr., Div. of Water, 1140—43rd St., Sacramento, Calif. (June '28)

Hostetler, Ervin W., Supt. of Distr., Iowa Water Service Co., 533 N. Linn, Iowa City, Iowa (June '27)

Hostettler, C. O., Chemist, Akron Water Purif. Plant, 128 E. Hall St., Kent, Ohio (Jan. '38)

Hostrup, C. F., 1213 Pacific St., Santa Monica, Calif. (Feb. '30)

Hot Springs Water Co., R. H. Teed, Hot Springs National Park, Ark. (Corp. M. Mar. '20)

Hotchkiss, Harry E., Purif. Mgr., Monomouth Consolidated Water Co., Red Bank, N. J. (July '39)

Hotchkiss, Henry T., Jr., Supervising Chemist, Larchmont, N. Y. (July '35)

Houser, George C., 220 Clyde St., Brookline, Mass. (Nov. '25)

Houston, W. J., Agent, W. D. Taulman, 175 Spring St., S.W., Atlanta, Ga. (Jan. '40)

Houston Water Dept., City of, Geo. L. Byrom, Acting Director, City Hall, Houston, Tex. (Corp. M. Sept. '34)

Hovey, Victor M., Supt., Oskaloosa Munic. Water Co., Oskaloosa, Iowa (Oct. '38)

Howard, Charles D., Chemist, State Board of Health, Concord, N. H. (Feb. '21)

Howard, N. J., Director of Water Purif., Island Filtration Labs., 410 Lake Shore, Centre Island, Toronto, Ont., Can. (June '20) *Director '35–'37. Vice-Pres. '40. President '41.*

Howard, Paul F., 138 Bartlett Rd., Winthrop, Mass. (Apr. '36)

Howe, B. V., San. Engr., San. Eng. Div., State Board of Health, State Office Bldg., Denver, Colo. (Apr. '30) *Fuller Award '40.*

Howe, H. S., Chief Engr., Scranton-Spring Brook Water Service Co., 135 Jefferson Ave., Scranton, Pa. (Jan. '39)

Howe, Henry L., City Engr., 52 City Hall, Rochester, N. Y. (Apr. '38)

Howe, Max G., Supt. of Water & Light, Union, S. C. (Jan. '38)

Howell, Eugene M., Asst. San. Engr., Farm Security Admin., 900 Sherman St., Denver, Colo. (Jan. '37)

Howes, D. W., Div. Engr., Board of Water Supply, 127 Broadway, Newburgh, N. Y. (Apr. '30)

Howland, E. Robert, British Pitometer Co., Victoria Station House, London, S.W. 1, England. (Apr. '14)

Howland, Warren E., Assoc. Prof. of Civ. Eng., School of Civ. Eng., Purdue Univ., West Lafayette, Ind. (Apr. '34)

Howson, Louis R., Alvord, Burdick & Howson, Engrs., 716 S. Oak St., Hinsdale, Ill. (Apr. '16) *Trustee '28-'30. Vice-Pres. '41.*

Hoy, J. R., San. Engr., 404 Hildebrandt Bldg., Jacksonville, Fla. (Feb. '30)

Hoy, Joseph A., Supervising Foreman, Water Dept., 18 E. Worcester St., Worcester, Mass. (May '22)

Hoyt, Earle S., San. Engr., 568 E. Broad St., Columbus, Ohio (May '30)

Hromada, Frank M., Filtration Plant Engr., U. S. Dept. of Justice, U. S. Southwestern Reformatory, El Reno, Okla. (Jan. '40)

Hubbard, Edward, Civ. Engr., Bureau of Water Works & Supply, Box 3669 Terminal Annex, Los Angeles, Calif. (Jan. '33)

Hubbert, E. G., Water Supt., Omak, Wash. (Jan. '37)

Hudson Dept. of Public Works, J. McClure Wardel, Supt. of Public Works, City Hall, Hudson, N. Y. (Corp. M. Oct. '38)

Hudson, H. E., Jr., Jr. San. Engr., Experimental Filtration Plant, 6843 Oglesby Ave., Chicago, Ill. (May '33)

Hudson, W. Rowland, Engr. & Supt., California Water & Telephone Co., 2130 Huntington Drive, San Marino, Calif. (Jan. '39)

Huffman, Benjamin F., Mgr., Rockport Water Works Co., Inc., 219 Main St., Rockport, Ind. (May '29)

Huffman, H. H., Supt., Water & Street Lighting Dept., Topeka, Kan. (June '32)

Hughart, J. H. P., Mgr., Transite Pipe Section, Johns-Manville Sales Corp., 222 North Bank Drive, Chicago, Ill. (July '38)

Hughes, George F., *see* Denver, City & County of

Hughes, Gresham, Mgr. & Secy., Mildura Urban Water Trust, Box 111, Mildura, Victoria, Australia (Apr. '38)

Hughes, S. C., *see* Deseronto Public Utilities Com.

Hughes, W. P., City Engr. & Water Supt., City Hall, Lewiston, Idaho. (Sept. '25) *Director '36-'38.*

Hulbert, Roberts, Asst. Supt., Filtration Plant, Water Works Park, Detroit, Mich. (Apr. '30)

Hull, Fred M., 1439—17th Ave., Columbus, Ga. (Apr. '40)

Hungerford, Churchill, Jr., Pres., Hungerford & Terry, Inc., Clayton, N. J. (Jan. '39)

Hunsaker, W. S., Local Mgr., California Water Service Co., 125 S. Church St., Visalia, Calif. (Jan. '36)

Hunt, Wm. G., Pump House Residence, R. R. No. 4, Peterborough, Ont., Can. (Apr. '24)

Hunter, Andrew, *see* New Westminster, City of

Hunter, G. A., Supt. of General Const., East Bay Munic. Utility Dist., 512—16th St., Oakland, Calif. (May '33)

Hunter, T. B., Cons. Engr., 41 Sutter St., San Francisco, Calif. (July '06)

Huntress, Charles O., Chem. Engr., Phillips Petroleum Co., Bartlesville, Okla. (Apr. '40)

Hurd, Edwin C., Cons. Engr., 1039 Architects & Builders Bldg., Indianapolis, Ind. (Apr. '38)

Hurdle, Reg. T., Engr., A. N. Eaton Metal Products Co., 715 S. Grand, Bozeman, Mont. (July '26)

Hurlbut, William W., Asst. Chief Engr. & Gen. Mgr., Bureau of Water Works & Supply, Box 3669 Terminal Annex, Los Angeles, Calif. (May '24) *Director '34-'36, '38. President '37.*

Hurst, Wm. Donald, Asst. Engr., City of Winnipeg, 223 James Ave., Winnipeg, Man., Can. (Apr. '34)

Hurtado, J. R., Civ. Engr., Guanabano a Amadores No. 29, Caracas, Venezuela, S. A. (Jan. '39)

Hushbeck, Harold R., Outside Supt., Water Dept., 268 Main St., City Hall, Watsonville, Calif. (Jan. '39)

Hutchins, R. T., Supt. of Water Dept., 209 W. Franklin Ave., El Segundo, Calif. (Oct. '38)

Hutchins, Will A., Supt., Water Dept., City of Freeport, Freeport, Ill. (Nov. '20)

Hutchinson, Dale, Water Comr., 45 S. Lake St., North East, Pa. (Jan. '40)

Hutchinson, Harry E., Treas., Princeton Water Co., 166 Nassau St., Princeton, N. J. (Apr. '39)

Hutchinson, M. C., Mng. Director, Victaulic Co. of Canada, Ltd., 200 Bay St., Toronto, Ont., Can. (Jan. '33)

Hutchison, A., Drummond, McCall & Co., Ltd., P. O. Box 219, Montreal, Que., Can. (May '21)

Hutton, Harold S., San. Engr., Wallace & Tiernan Co., Inc., Box 178, Newark, N. J. (Apr. '20)

Huy, Harry M., Engr., 90 Broad St., New York, N. Y. (July '36)

Hyde, Charles Gilman, Cons. Hydr. & San. Engr., Prof. of San. Eng., Univ. of California, Berkeley, Calif. (July '07) *Honorary M. '39.*

Hyde, Ralph H., Vice-Pres. & Gen. Mgr., Campbell Water Co., Box 1, Campbell, Calif. (May '27)

Hydraulic Development Corp., West Medford Station, Boston, Mass. (Assoc. M. May '25)

Hyland, Edward P., Supt., Water Dept., Town Hall, Moorestown, N. J. (Jan. '36)

Hyman, H. H., Mgr., Miami Water Co., Box 3100, Miami, Fla. (Apr. '16)

Ickler, Herbert, Staff Mgr., Johns-Manville Sales Corp., Broad St. Station Bldg., Philadelphia, Pa. (July '37)

Idaho Surveying & Rating Bureau, R. C. Stevenson, Box 1069, Boise, Idaho (Corp. M. Feb. '24)

Idaho, Univ. of, H. Loren Thompson, Civ. Eng. Dept., Moscow, Idaho (Corp. M. Jan. '35)

Ihling, Herbert M., Field Engr., Water Dept., City Engr.'s Office, City Hall, Milwaukee, Wis. (Jan. '40)

Ilion Board of Water Comrs., Ilion, N. Y. (Corp. M. Mar. '24)

Illinois Inspection Bureau, C. W. Soderstrom, 309 W. Jackson Blvd., Chicago, Ill. (Corp. M. Jan. '24)

Imbeaux, Edouard, Ing. du Ponts et Chaussees, 18, Rue Emile-Galle, Nancy, France (May '30)

Indiana Dept. of Conservation, C. H. Bechert, State Library Bldg., Indianapolis, Ind. (Corp. M. Jan. '38)

Indiana State Board of Health, Bureau of San. Eng., B. A. Poole, Chief Engr., 1098 W. Michigan St., Indianapolis, Ind. (Corp. M. June '26)

Industrial Chemical Sales Div., West Virginia Pulp & Paper Co., 230 Park Ave., New York, N. Y. (Assoc. M. May '31)

Inglee, Clinton, Pres. & Gen. Mgr., National Water Main Cleaning Co., 30 Church St., New York, N. Y. (July '35) *Director '39-'41.*

Inglewood Water Dept., D. H. Griffith, Supt., City Hall, Inglewood, Calif. (Corp. M. Oct. '38)

Ingram, William T., San. Engr., San Joaquin Local Health Dist., Box 111, Stockton, Calif. (July '35)

Inman, C. E., Comr. & Supt., Water Works, Warren, Ohio (May '21)

Insull, William, *see* Bowling Green City Water Co.

International Filter Co., P. F. Pew, 325 W. 25th Pl., Chicago, Ill. (Assoc. M. Nov. '15)

Iowa Valve Co., C. S. Howard, Vice-Pres., 812 Hubbell Bldg., Des Moines, Iowa (Assoc. M. Nov. '28)

Ireland, Dan W., City Chemist, Burlington, N. C. (Jan. '30)

Irish, J. Wilbur, Cons. Engr., 906 South St., Peekskill, N. Y. (Jan. '36)

Irwin, Gifford M., City Engr., City Hall, Victoria, B. C., Can. (Nov '33)

Irwin, Harry F., Asst. Supt., Water Works & Parks, City Hall, Ogden, Utah (July '36)

Irwin, Wm. F., Sales Repr., Louisville Cement Co., 2538 Hackberry St., Cincinnati, Ohio (Oct. '38)

Isaac, F. N., Local Mgr., California Water Service Co., Hanford, Calif. (May '08)

Isham, Orrin, Supt., Oxnard Munic. Water Dept., P. O. Box 446, Oxnard, Calif. (Oct. '38)

Itter, Charles J., Jr. Engr., Dept. of Water & Power, Box 3669 Terminal Annex, Los Angeles, Calif. (Oct. '34)

Ivanissevich, Don Ludovico, *see* Argentina, Obras Sanitarias de la Nacion

Jack, D., Asst. Engr., Public Health Eng. Div., Dept. of National Health, 15 Bank of Nova Scotia Bldg., St. Catharines, Ont., Can. (Apr. '37)

Jackson, David J., Chemist, Tarentum Water Dept., 402 Allegheny St., Tarentum, Pa. (Jan. '40)

Jackson, H. W., Supt. of Water Works, 912 Arctic St., Antigo, Wis. (Aug. '24)

Jackson, Hollace W., Sanitarian, State Board of Health, 108 W. Second St., Bloomington, Ind. (Oct. '38)

Jackson, Leslie A., Mgr., Little Rock Munic. Water Works, 425 W. Capitol Ave., Little Rock, Ark. (Apr. '36)

Jackson, T. B., Pres. & Gen. Mgr., Boise Water Corp., 623 Idaho St., Boise, Idaho (July '35)

Jacobs, Joseph, Cons. Civ. Engr., 613-16 Fourth & Cherry Bldg., Seattle, Wash. (July '20)

Jacobs, L. L., Asst. Supt., Newnan Water & Light Com., Newnan, Ga. (July '35)

Jacobs, Nathan B., Pres., Morris Knowles, Inc., 507 Westinghouse Bldg., Pittsburgh, Pa. (Sept. '30)

Jacobs, S. Willard, Vice-Pres., Electro Bleaching Gas Co., 60 East 42nd St., New York, N. Y. (Feb. '19)

Jacobson, E. E., Mgr., Lexington Water Co., 167 N. Upper St., Lexington, Ky. (Apr. '32) *Director '39-'41.*

Jacques, Henry L., Engr. of Major Const., Bureau of Water Works & Supply, Box 3669 Terminal Annex, Los Angeles, Calif. (Sept. '31)

Jagger, J. E., Vice-Pres. & Chief Engr., Alabama Water Service Co., Birmingham, Ala. (July '35)

James, A. M., City Secy., Hillsboro, Tex. (Oct. '39)

James, Elmo, Const. Foreman, W. 2626 Euclid Ave., Spokane, Wash. (Jan. '38)

Jamestown Board of Public Utilities, Water Div., Clayton O. Johnson, Supt., Jamestown, N. Y. (Corp. M. Jan. '39)

Janzig, Alexander C., Columbia Heights Filtration Plant, Minneapolis, Minn. (Oct. '21)

Jarrett, J. M., State Board of Health, Raleigh, N. C. (June '27)

Jarvis, Alexander Charles, Water Purif. Specialist, Jens Kofoedsgade 4, Copenhagen, Denmark (May '14)

Jarvis, L. E., Supt., Water & Light Dept., Box 224, Cashmere, Wash. (July '35)

Jasper Munic. Elec. & Water Dept., Joseph P. Kunkel, Supt., Jasper, Ind. (Corp. M. Apr. '39)

Jeffrey Mfg. Co., W. L. Bradshaw, Asst. Mgr., San. Eng. Div., Columbus, Ohio (Assoc. M. Apr. '37)

Jenkins Bros., Herbert J. Barnsley, 80 White St., New York, N. Y. (Assoc. M. May '20)

Jenkins David, New Jersey Zinc Co., Franklin, N. J. (Oct. '22)

Jenkins, E. D., 803 Indiana St., Martins Ferry, Ohio (Apr. '36)

Jenkins, E. J., Supt. of Distr., Philadelphia Suburban Water Co., 762 Lancaster Ave., Bryn Mawr, Pa. (Feb. '25)

Jenks, Harry N., Cons. San. Engr., 345 Madrono Ave., Palo Alto, Calif. (Jan. '17)

Jennings, Fred Huntington, Supt. of Filtration, Dept. of Water, 1146 Boyd St., Watertown, N. Y. (July '38)

Jensen, Frank B., Supt., Council Bluffs City Water Works, Council Bluffs, Iowa (Jan. '35)

Jensen, J. Arthur, Engr., Water Works Dept., Minneapolis, Minn. (Apr. '10) *Trustee '25-'27. Director '31-'33, '41. President '40.*

Jensen, O. F., Mgr., Layne-Texas Co., Drawer "B"-Central Park Station, Houston, Tex. (July '38)

Jenson, R. M., Supt. of Water Works, Grand Forks, N. D. (July '35)

Jerden, Alfred, *see* Malmö Byggnadskontor

Jernigan, Harold N., Sales Engr., 136 Arcadia Park, Lexington, Ky. (Oct. '35)

Jerome Water Co., Wm. A. Peters, Jerome, Idaho (Corp. M. July '35)

Jessee, Vince, Supt., Water Dept., 630 East E St., Elizabethton, Tenn. (Oct. '39)

Jester, John M., Engr., Div. of Eng., Robert B. Morse Filter Plant, Silver Spring, Md. (July '37)

Jeup, Bernard H., Chem. Engr., Bureau San. Eng. Labs., State Board of Health, 201 State House Annex, Indianapolis, Ind. (May '25)

Jewell, G. H., Dist. Mgr., Builders Iron Foundry, 122 S. Michigan Ave., Chicago, Ill. (Apr. '34)

Jewell, William V., Chief Bookkeeper, Dept. of Public Works, 630 Bergen Ave., Jersey City, N. J. (Nov. '27)

Jiannott, William, Supt., Thornwood Water Dist., Thornwood, N. Y. (July '35)

Johns-Manville Sales Corp., C. A. McGinnis, 22 E. 40th St., New York, N. Y. (Assoc. M. Mar. '33)

Johnson, Arthur B., 647 Maltman Ave., Los Angeles, Calif. (Jan.'38)

Johnson, B. French, Chemist, New Castle Water Co., 31 N. Mill St., New Castle, Pa. (Apr. '39)

Johnson, C. O., *see* Grand Rapids Water Dept.

Johnson, Carl, Chief Operator, Water Plant, 803 S. Broadway, Leavenworth, Kan. (Apr. '40)

Johnson City Water Dept., Arthur J. Merrill, Supt., Johnson City, N Y. (Corp. M. Sept. '25)

Johnson, Clayton O., Supt., Board of Public Utilities, Jamestown, N. Y. (May '34)

Johnson, Dewey W., Cast Iron Pipe Research Assn., 122 S. Michigan Ave., Chicago, Ill. (Jan. '37)

Johnson, E. M., Asst. Supt., Water Dept., 1109 Mordecai Drive, Raleigh, N. C. (Jan. '30)

Johnson, E. P., 418 Flannery Bldg., Station No. 13, Pittsburgh, Pa. (July '35)

Johnson, Edgar W., Sr. Engr., Minneapolis Water Dept., Route 8, Box 352, Minneapolis, Minn. (July '17)

Johnson, Edward E., Inc., W. M. Bollenbach, 2304 Long Ave., St. Paul, Minn. (Assoc. M. May '22)

Johnson, Francis M., San. Engr., Box 154, Murphy, N. C. (Oct. '37)

Johnson, H. B., Water Supt., State & Jackson Sts., Media, Pa. (Jan. '37)

Johnson, H. M., *see* Anaconda Copper Mining Co.

Johnson, Howard A., 141 Howeland Circle, Danville, Va. (Nov. '28)

Johnson, Meredith E., State Geologist, State House Annex, Trenton, N. J. (Affil. July '38)

Johnson, Millard L., Mgr., Palos Verdes Water Co., Box 71, Palos Verdes Estates, Calif. (July '36)

Johnson, Morgan A., Palmer Supply Co., 222 Westlake Ave., N., Seattle, Wash. (Apr. '36)

Johnson, Nathaniel G., Supt., Burlington City Water Dept., E. Pearl St., Burlington, N. J. (July '39)

Johnson Olin, Pres., Chateaugay Water Co., Chateaugay, N. Y. (Apr. '40)

Johnson, R. K., Dist. Sales Mgr., Darling Valve & Mfg. Co., 70 Pine St., New York, N. Y. (Jan. '28)

Johnson, Robert M., Chemist & Chief Operator, Water Softening & Purif. Plant, 14 Garnett Ave., St. Augustine, Fla. (Apr. '40)

Johnson, Samuel C., Chem. Engr., Dearborn Chemical Co., Straus Bldg., Chicago, Ill. (Apr. '23)

Johnson, Theodore S., Prof., North Carolina State College, P. O. Box 2103, Raleigh, N. C. (Jan. '40)

Johnson, W. B., Asst. Supt., Bureau of Water, City Hall, Easton, Pa. (Jan. '37)

Johnson, W. H., Supt. of Water Works, Harrodsburg, Ky. (Feb. '31)

Johnson, W. Scott, Chief Public Health Engr., Div. of Public Eng. & Sanitation, 200 Monroe St., Jefferson City, Mo. (Feb. '24)

Johnston, E. C., Supt., Water Dept., Jacksonville, Tex. (Oct. '39)

Johnston, E. W., Asst. San. Engr., San. Eng. Div., Ontario Dept. of Health, Parliament Bldgs., Toronto, Ont., Can. (Feb. '34)

Johnston, W. E., Sales Repr., National Meter Co., Box 1232, St. Augustine, Fla. (Oct. '37)

Johnstone, Alan McC., Mgr., Water Softening Plant, Orangeburg Water & Light Plant, 79 Ellis Ave., Orangeburg, S. C. (Jan. '40)

Jones, Carl C., Sidney, Neb. (July '35)

Jones, Clark W., Supt. of Water Works, Dalton, Ga. (Apr. '36)

Jones, Earl F., Jersey Shore Water Co., Jersey Shore, Pa. (Mar. '27)

Jones, Ernest G., Asst. Foreman, Repair Dept., Rochester Water Works, 10 Felix St., Rochester, N. Y. (Jan. '40)

Jones, Fred D., Chief Meter Inspector, 305 City Hall, Spokane, Wash. (Jan. '38)

Jones, H. Seaver, Pres., Centriline Corp., 90 West St., New York, N. Y. (July '22)

Jones, Harvey P., Cons. Engr., 1606 Second National Bank Bldg., Toledo, Ohio (July '22)

Jones, James E., Asst. Engr., Los Angeles Dept. of Water & Power, Box 3669 Terminal Annex, Los Angeles, Calif. (Oct. '33)

Jones, Max K., Mgr., Huntington Water Corp., Huntington, W. Va. (July '35)

Jones, Morris S., Chief Engr. & Gen. Mgr., Pasadena Water Dept., 319 City Hall, Pasadena, Calif. (Oct. '24)

Jones, T. E., Supt., City Water Works, Bridgeport, Ala. (Jan. '40)

Jones, W. B., Secy., James Jones Co., 201 Leroy St., Los Angeles, Calif. (Oct. '31)

Joos, C. E., Mgr., Water Conditioning Div., Cochrane Corp., 17th & Allegheny Ave., Philadelphia, Pa. (Apr. '39)

Jordan, Ben S., Asst. Supt., Heat, Light & Water Dept., Clemson, S. C. (Jan. '40)

Jordan, Frank C., Secy., Indianapolis Water Co., 113 Monument Circle, Indianapolis, Ind. (June '11) *Trustee '20–'22. Vice-Pres. '24. President '25. Exec. Com. '26–'27. Fuller Award '40.*

Jordan, Harry E., Secy., American Water Works Assn., 22 E. 40th St., New York, N. Y. (Oct. '19) *Director '32–'34, '36. President '35. Diven Medal '36. Secretary '37–. Honorary M. '39.*

Jordan, William H., Asst. Supt. of Grounds & Chief San. Patrolman, East Bay Munic. Utility Dist., 512—16th St., Oakland, Calif. (May '33)

Jorgensen, Homer W., Asst. San. Engr., Bureau of San. Eng., 3093 Life Science Bldg., Berkeley, Calif. (Oct. '39)

Joslyn, Ray O., Mgr., Layne Western Co., B.M.A. Bldg., Kansas City, Mo. (May '30)

Joyce, Charles V., Div. Engr., Washington Suburban San. Dist., Hyattsville, Md. (Jan. '37)

Judd, Thomas H., Engr., Washington Water Power Co., Spokane, Wash. (Jan. '38)

Judge, James H., Dist. Mgr., Neptune Meter Co., 130 N. Jefferson St., Chicago, Ill. (Apr. '34)

Judson, H. T., Portland Mgr., Hersey Mfg. Co., 1231 N. W. Hoyt St., Portland, Ore. (Mar. '29)

Juengst, Henry F., 1624 S. 25th St., St. Joseph, Mo. (Oct. '39)

Juhlin, Charles, *see* Aurora Water & Light Com.

Junod, J. W., Mayor, 527 W. H St., Colton, Calif. (Jan. '40)

Justus, O. H., Water Works Operator, City Water Works, Box 2037, Vienna, W. Va. (Affil. Jan. '40)

Jutz, Charles E., Pres., St. Louis County Water Co., 6600 Delmar Ave., St. Louis, Mo. (Apr. '20)

Kable, Edgar P., Gen. Mgr., York Water Co., 42 E. Market St., York, Pa. (Nov. '17)

Kachorsky, Michael S., Supt., Dept. of Public Works, Box 283, Manville, N. J., (June '39)

Kadinger, Fred, Plant Supt., Com. on Public Works, Juneau, Wis. (Jan. '40)

Kahn, James M., Sales Engr., International Filter Co., 1314 Rhodes-Haverty Bldg., Atlanta, Ga. (Jan. '34)

Kallis, M. A. (Mrs.), 829 Hickory St., Waukegan, Ill. (May '33)

Kanhauser, Frank, Chemist-Chief, Kaznejov bei Pilsen, Czechoslovakia (July '35)

Kansas City Water Dept., Director, City Hall, Kansas City, Mo. (Corp. M. Feb. '15)

Kansteiner, H. H., Mgr., Production & Distr., Waterworks Dept., Leavenworth, Kan. (Apr. '37)

Kappe, Stanley E., 627 W. Kingsley St., Philadelphia, Pa. (Apr. '32)

Kapuskasing, Corp. of Town of, Water Dept., Clement Saville, Town Hall, Kapuskasing, Ont., Can. (Corp. M. Jan. '35)

Karl, Fred W., *see* Abercrombie, J. S., Co.

Karr, Roy W., Sales Repr., Mueller Co., 3305 N. E. 44th Ave., Portland, Ore. (Jan. '38)

Kavanagh, Gerald R., Dist. Mgr., Wallace & Tiernan Co., Inc., P. O. Box 27, Lenoir City, Tenn. (July '39)

Kay, J. W., *see* Milford Water Co.

Kearney, E. W., State Board of Health, Morganton, N. C. (Jan. '30)

Keasbey & Mattison Co., A. B. Spaulding, Sales Mgr., Butler Ave., Ambler, Pa. (Assoc. M. Oct. '37)

Keenan, F. E., Supt. of Water Works, Gunnison, Colo. (Oct. '29)

Keene, R. W., Pacific Coast Mgr., Hersey Mfg. Co., 450 E. Third St., Los Angeles, Calif. (Feb. '27)

Keils, Anthony, Supt., Mt. Clemens Water Works, 38 Moross Ave., Mt. Clemens, Mich. (June '09)

Keily, C. J., Supt & Treas., Jamaica Water Supply Co., 161-20—89th Ave., Jamaica, L. I., N. Y. (Nov. '29)

Keim, H. S., Supt., White Deer Mountain Water Co., 114 S. Front St., Milton, Pa. (Jan. '37)

Keirn, K. A., Wallace & Tiernan Co Inc., 293 Larkin St., Buffalo, N. Y. (July '35)

Keis, F. J., Cons. Engr., 257 Broadway, Troy, N. Y. (Apr. '27)

Keiser, Richard K., Gen. Mgr., Sinking Spring Water Co., 1904 Penn Ave., West Lawn, Pa. (Apr. '40)

Keith, J. Clark, Gen. Mgr., Windsor Utilities Com., Canada Bldg., Windsor, Ont., Can. (Mar. '23) *Director '41-'43.*

Keliher, Timothy, Supt., Williamsport Water Co., Williamsport, Pa. (Feb. '17)

Kelleher, Jos. T., Supt., Martinez Water System, City Hall, Martinez, Calif. (Oct. '37)

Keller, George John, Secy. & Gen. Mgr., Iowa City Water Co., Iowa City, Iowa (Nov. '14)

Keller, S. K., Gen. Supt., Pinellas County Water System, P. O. Box 151, Clearwater, Fla. (July '38)

Kelley, A. I., Personnel Coordinator, Bureau of Water Works & Supply, 207 S. Broadway, Los Angeles, Calif. (Jan. '40)

Kelley, C. F., Supt., Napoleon Water Works & Elec. Light Plant, 217 W. Washington St., Napoleon, Ohio (Jan. '39)

Kelley, C. H., Mgr., Butler Water Co., Butler, Pa. (July '24)

Kelley, F. W., *see* Belle Glade Water Works

Kelley, Frank, Supt., Valhalla Water Dist., 25 Cedar St., Valhalla, N. Y. (Jan. '40)

Kellner, Hugh, Chief Engr., City Water Works, 350 Moy Ave., Windsor, Ont., Can. (Feb. '23)

Kellogg, C. E., *see* Mt. Morris Water Dept.

Kellogg, James W., Bacteriologist & Chemist, State Lab. of Hygiene, Raleigh, N. C. (June '21) *Director '41-'43.*

Kelsey, Reginald A., Aqueduct Patrolman-in-Charge, Dept. of Water & Power, Box 188, Mojave, Calif. (July '38)

Kelso, A. E., *see* Melbourne & Metropolitan Board of Works

Kelso, Gilbert L., West Virginia Public Health Training Center, Morgantown, W. Va. (May '30)

Kempkey, Augustus, Cons. Engr., 416 Hobart Bldg., San Francisco, Calif. (June '23)

Kendall, Theodore Reed, Eng. Editor, *The American City,* 470 Fourth Ave., New York, N. Y. (Mar. '19)

Kennedy, Charles T., Service Director, Water & Service Dept., 1556 E. State St., Salem, Ohio (Apr. '40)

Kennedy, Clyde C., Civ. Engr., Atlas Bldg., 604 Mission St., San Francisco, Calif. (Oct. '27)

Kennedy, Robert C., Asst. Chief Engr. & Asst. Gen. Mgr., East Bay Munic. Utility Dist., 512—16th St., Oakland, Calif. (May '33)

Kennedy Valve Mfg. Co., M. E. Kennedy, Treas., Elmira, N. Y. (Assoc. M. Mar. '11)

Kennison, Karl R., Chief Engr., Metropolitan Dist., Water Supply Com., 20 Somerset St., Boston, Mass. (July '39)

Kennon, James H., Mng. Engr., Bureau of Water, 416 City-County Bldg., Pittsburgh, Pa. (Sept. '29)

Kenny, Norbert J., Pres., National Meter Co., 4207—1st Ave., Brooklyn, N. Y. (Apr. '38)

Kenosha Water Dept., James M. Myers, Jr., Supt., Kenosha, Wis. (Corp. M. Apr. '37)

Kentucky State Board of Health, F. C. Dugan, Director, Bureau of San. Eng., 620 S. 3rd St., Louisville, Ky. (Corp. M. Feb. '15) *Director '33-'35.*

Kentucky Utilities Co., E. W. Brown, 159 W. Main St., Lexington, Ky. (Corp. M. Feb. '05)

Kepner, Dana E., Mfr's. Repr., 1921 Blake St., Denver, Colo. (Oct. '25) *Fuller Award '39.*

Kerr, S. Logan, Hydr. Engr., 30 E. Mount Pleasant Ave., Philadelphia, Pa. (Jan. '35)

Kershaw, Neil, Chief Chemist, Indianapolis Water Co., 113 Monument Circle, Indianapolis, Ind. (Jan. '37)

Kerslake, James E., Supt. of Filtration, Water Purif. Plant, 3000 N. Lincoln Memorial Drive, Milwaukee, Wis. (May '30)

Kessler, Lewis H., Acting Chairman, Dept. of Hydr. & San. Eng., Univ. of Wisconsin, Madison, Wis. (June '30)

Ketcham, Valentine O., Gen. Mgr., Stamford Water Co., 51 Summer St., Stamford, Conn. (July '26)

Kienle, John A., Vice-Pres., Mathieson Alkali Works, Inc., 60 E. 42nd St., New York, N. Y. (June '09) *Director '36-'38, '40-'42. Honorary M. '40.*

Kiker, John E., Jr., 54 Noxon St., Poughkeepsie, N. Y. (May '33)

Kilkenny, T. D., City Engr., City Hall, Vallejo, Calif. (Oct. '39)

Killam, Elson T., Hydr. & San. Engr., 142 Maiden Lane, New York, N. Y. (Dec. '31)

Killam, Samuel E., Supt., Distr. Section, Water Div., 20 Somerset St., Boston, Mass. (Nov. '15)

Killian, Paul, Supt., Peoples Water Service Co., Brunswick, Ga. (Mar. '30)

Kimberly, A. Elliott, Cons. San. Engr., 20 S. Third St., Columbus, Ohio (May '23)

King, Kenneth K., Director, Water Dept., City Hall, Kansas City, Mo. (July '40)

King, McKay, Asst. County Engr., Court House, Louisville, Ky. (July '39)

King, Oscar L., Waterworks Supt., Kingsport, Tenn. (July '35)

King, R. M., Chief Engr., Layne-Arkansas Co., Stuttgart, Ark. (July '38)

King, Roy S., *see* Midland Public Utilities Com.

King, W. L., *see* Hempstead, Inc., Village of

King, William B., Water Plant Operator, Water & Sewage Dept., City Hall, Oxford, N. C. (July '39)

Kingman, Dean S., Civ. Engr , Route #1, Sterling, Ill. (July '37)

Kingsley, George, Canal Point, Fla. (July '35)

Kingsley, J. T., Supt., Covington City Water Works, Covington, Ky. (Jun. '20)

Kingston, T. M. S., *see* Chatham Board of Water Comrs.

Kinney, E. F., Sales Mgr., Wallace & Tiernan Co., 2304 E. 59th St., Indianapolis, Ind. (Apr. '38)

Kinney, James B., Mgr., Wallace & Tiernan Ltd., 350 Sorauren Ave., Toronto, Ont., Can. (Jan. '37)

Kinsel, Harry L., 385 Newtonville Ave., Newtonville, Mass. (July '35)

Kipp, Ed., Supt., Marshfield Elec. & Water Dept., Marshfield, Wis. (Jan. '39)

Kipp, W. H., Mgr., Waterworks Supplies, Inc., 809 S. E. Modisca St., Portland, Ore. (Apr. '40)

Kircher, A. M., City Engr., City Hall, Mankato, Minn. (Oct. '39)

Kirchman, William, Chemist, Filter Plant, Fairmont, W. Va. (May '31)

Kirchoffer, William Gray, San. & Hydr. Engr., 22 N. Carroll St., Madison, Wis. (Jan. '23)

Kirk, Lawerence, Service Engr., National Aluminate Corp. of Chicago, 83 S. Terrace, Fargo, N. D. (Apr. '39)

Kirkpatrick, John W., Engr., 201 State House Annex, Indianapolis, Ind. (Jan. '37)

Kirkpatrick, William, Maint. Engr., Water & Sewerage Board, Water Engr's. Office, Cross Roads P. O., Jamaica, B.W.I. (July '34)

Kitchener Water Com., J. C. Breithaupt, City Hall, Kitchener, Ont., Can. (Corp. M. Feb. '20)

Kittrell, F. W., State Dept. of Public Health, Nashville, Tenn. (July '35)

Kivari, A. M., Pacific Coast Mgr., The Dorr Co., Inc., 811 W. 7th St., Los Angeles, Calif. (Sept. '31)

Klang, E. H., Supt., Water & Light Dept., Staples, Minn. (Apr. '39)

Klassen, Clarence W., Chief San. Engr., State Dept. of Public Health, Springfield, Ill. (Jan. '35)

Klaumann, Chas. H., Supt., Water Works, Iola, Kan. (Jan. '39)

Klaus, Fred J., City Engr., City of Sacramento, 205 City Hall, Sacramento, Calif. (Oct. '15)

Klein, Austin R., *see* Mishawaka Water & Elec. Plant

Klein, George C., Draftsman, Dept. of Water & Power, Box 3669 Terminal Annex, Los Angeles, Calif. (Apr. '36)

Klein, William I., Cons. Engr., 21 Maple Terrace, East Orange, N. J. (July '13)

Kleinsmith, Walter, Supt. Water Dept., 387 Broadway, Woodlawn, Ore. (Apr. '40)

Kleiser, Paul J., Engr., State Board of Health, 201 State House Annex, Indianapolis, Ind. (Jan. '37)

Kline, Hubert S., Chemist-Bacteriologist, 35 Valleyview Drive, Dayton, Ohio (Oct. '36)

Klorer, John, Cons. & Planning Engr., Sewerage-Water Board of New Orleans, 526 Carondelet St., New Orleans, La. (July '37)

Knapp, Frank, Supt., Water Dept., 12-80 Fourth St., Fairlawn, N. J. (Jan. '40)

Kneale, John S., Jr., Chemist in Charge, New York Water Service Corp., 2015 Church Ave., Brooklyn, N. Y. (Jan. '38)

Kneeland, H. C., Water Analyst, 51 S. Jackson Ave., Pittsburgh, 2, Pa. (Apr. '39)

Knickerbacker, John, Pres. Eddy Valve Co., 86 First St., Troy, N. Y. (June '13)

Knight, G. Webber, Mgr., Natrona Water Co., Natrona, Pa. (Dec. '25)

Knittel, E. A., Lynden, Wash. (July '35)

Knoedler, H. A., Western Mgr., Inertol Co., Inc., 64 South Park, San Francisco, Calif. (Oct. '37)

Knott, John J., Supt., Mutual Water Co., 3923 Clara St., Cudahy, Calif. (Oct. '37)

Knowles, C. R., Supt., Water Service, Illinois Central System, 135 E. 11th Pl., Chicago, Ill. (June '13) *Director '31–'33.*

Knowlton, E. C., Gen. Mgr., Anniston Water Dept., Anniston, Ala. (Jan. '40)

Knox, Stuart K., Cons. Engr., 25 Warfield St., Montclair, N. J. (June '09)

Knox, W. H., Asst. Engr., State Dept. of Health, Columbus, Ohio (Jan. '27)

Knoxville Elec. Power & Water Board, M. B. Whitaker, Supt., City Hall Park, Knoxville, Tenn. (Corp. M. May '23)

Knudsen, H. A., Mech. & Elec. Engr., East Bay Munic. Utility Dist., 512—16th St., Oakland, Calif. (Oct. '37)

Koebig, Adolf H., Jr., Cons. Engr., 821 Rowan Bldg., 458 S. Spring St., Los Angeles, Calif. (July '34)

Kohl, Lewis E., Supt. of Water, Water Works Div., 310 Terminal Bldg., Rochester, N. Y. (July '38)

Koon, Ray Emerson, Stevens & Koon, Cons. Engrs., Spalding Bldg., Portland, Ore. (Feb. '22)

Korff, Frank, Chief Engr., Tonawanda Water Works, Chestnut St., Tonawanda, N. Y. (Apr. '40)

Korves, Albert A., 245 Ross Park, Syracuse, N. Y. (July '35)

Koster, Roy F., 414 W. Adams St., Los Angeles, Calif. (Aug. '27)

Kramer, Warren A., State Board of Health, 200 Monroe St., Jefferson City, Mo. (Mar. '27)

Kranaskas, A. J., Asst. Engr., Div. San. Eng., State Health Dept., Capitol Bldg., Charleston, W. Va. (Affil. Jan. '39)

Krassy, Charles M., Box 297, Manville, N. J. (Jan. '37)

Krause, John W., Chief Engr., La Grange Water Works, 131 S. Brainard Ave., La Grange, Ill. (Mar. '32)

Krell, Abraham John, Chemist & Bacteriologist, 184 E. 95th St., New York, N. Y. (Apr. '39)

Kriegsheim, Heinrich, 200 W. 86th St., New York, N. Y. (May '15)

Kriesel, Fred, Supt., Water & Light Dept., Ortonville, Minn. (Jan. '39)

Kriz, Frank, Div. Engr., Water Div., 1640 S. Kingshighway Blvd., St. Louis, Mo. (Jan. '38)

Kroeze, H. A., Director, Div. of San. Eng., Mississippi State Board of Health, Jackson, Miss. (Jan. '38)

Kroschwitz, Fred., Salesman, Mueller Co., 563 Cleardale Ave., Trenton, N. J. (July '40)

Krum, Harry J., City Chemist, City Lab., Jefferson & Lawrence Sts., Allentown, Pa. (July '39)

Krum, Harry J., Jr., Asst. Engr., Pennsylvania Dept. of Health, 609 Trust Company Bldg., Meadville, Pa. (Affil. Jan. '40)

Krumm, Tahlman, Cons. Engr., 65 Meadow Park Rd., Bexley, Columbus, Ohio (Jan. '38)

Kuehn, Nicholas H., Jr., Jr. San. Engr., Water Purif. Div., S. Head House, Navy Pier, Chicago, Ill. (Jan. '40)

Kuester, John H., Supt., Water Works, 370 Naymut St., Menasha, Wis. (June '23)

Kuhn, A. Burgin, Jr., Diamond Alkali Sales Corp., Davidson, N. C. (Jan. '40)

Kuhns, Hayes R., The Leadite Co., Killbuck, Ohio (Sept. '30)

Kulin, Harvey J., Sales Engr., 3604 Prairie Ave., Brookfield, Ill. (Oct. '39)

Kunigk, W. A., Supt., Water Div., 2903 N. 26th St., Tacoma, Wash. (Aug. '24) *Director '31–'32.*

Kunkel, Joseph P., *see* Jasper Munic. Elec. & Water Dept.

Kunkle, Charles W., Vice-Pres. & Gen. Mgr., Johnstown Water Co., 445 Tioga St., Johnstown, Pa. (June '24)

Kupper, C. J., Cons. Engr., 409 E. Main St., Bound Brook, N. J. (June '29)

Kuranz, A. P., Supt., Water Dept., Waukesha, Wis. (Oct. '31)

Kurtz, William C., Chemist, Western New York Water Co., Woodlawn Station, Lackawanna, N. Y. (May '30)

Kydd, Paul M., Pres., Jamaica Water Supply Co., 161-20—89th Ave., Jamaica, N. Y. (Dec. '31)

Laase, William F., Asst. Engr., Dept. of Water Supply, Gas & Electricity, New York City, 142-26—32nd Ave., Flushing, N. Y. (May '24)

Labsap, A. H., Water Supt., Longview, Wash. (Dec. '27)

La Due, Wendell, R., Chief Engr. & Supt., Bureau of Water Supply, Municipal Bldg., Akron, Ohio (July '34) *Fuller Award '39. Director '40–'42.*

Lafayette Water Works, Glen J. Garman, Supt., Lafayette, Ind. (Corp. M. Dec. '37)

Laflin, Albert A., Supt., Water Works, St. Stephen, N.B., Can. (June '20)

Lafreniere, Theo. J., San. Engr., Board of Health of Province of Quebec, 89 Notre Dame, E., Montreal, Que., Can. (June '16) *Fuller Award '40.*

Laguna Beach Co. Water Dist., G. W. Prior, Laguna Beach, Calif. (Corp. M. May '27)

Lake, Madeline Lynch (Mrs.), Water Bacteriologist, Dept. of Water & Power, Box 3669 Terminal Annex, Los Angeles, Calif. (Oct. '34)

Lake Forest Water Dept., J. C. McNicol, Mgr., City Hall, Lake Forest, Ill. (Corp. M. May '27)

Lamar, W. B., Chief Engr., Munic. Light & Water Dept., 806 Cynthia St., Poplar Bluff, Mo. (Jan. '40)

Lamar, William L., Assoc. Chemist, U. S. Geological Survey, Washington, D. C. (Jan. '37)

LaMarre, Rene J., Supervisor of Filtration, Detroit Dept. of Water, 8300 W. Warren Ave., Dearborn, Mich. (Jan. '35)

Lamb, Carter H., Valuation Engr., Jamaica Water Supply Co., 161-20 89th Ave., Jamaica, N. Y. (Jan. '38)

Lambert, Carl F., Utility Engr. & Consultant, 807 Biscayne Bldg., Miami, Fla. (Apr. '30)

La Mesa, Lemon Grove & Spring Valley Irrigation Dist., C. Harritt, Gen. Mgr. & Chief Engr., 4769 Spring St., La Mesa, Calif. (Corp. M. Apr. '39)

Lamm, Walter E., George West Utilities Co., George West, Tex. (Oct. '39)

Lamond, A. W., Water Analyst, Alexandria Water Co., 4 Cedar St., Alexandria, Va. (Feb. '32)

Lampley, J. H., Mgr., Board of Water Comrs., Hendersonville, N. C. (Aug. '26)

Lampman, Edward B., 455 Algonquin St., Detroit, Mich. (Jan. '38)

Lampman, K. J., Water Works Supt., Public Utilities Com., Exeter, Ont., Can. (Jan. '37)

Landgraf, Geo. F., Water Dept. Engr., City Hall, Royal Oak, Mich. (Apr. '39)

Lane, D. Arnold, Asst. Engr., Los Angeles Dept. of Water & Power, 1349 Winchester Ave., Glendale, Calif. (Apr. '31)

Lang, Franklin, Vice-Pres. & Gen. Mgr., Feedwaters, Inc., 140 Cedar St., New York, N. Y. (Feb. '30)

Langelier, Wilfred F., Assoc. Prof. San. Eng., Univ. of California, Berkeley, Calif. (Feb. '23)

Langston, J. H., Mfr's. Agent, 311½ Zack St., Tampa, Fla. (July '38)

Languell, Louie, Supt., Salem Water Works, Salem, Ind. (Apr. '39)

Lansford, Paul T., 4828 Kenwood Ave., Chicago, Ill. (Apr. '38)

Lansing Board of Water & Elec. Light Comrs., Otto E. Eckert, Gen. Mgr., Lansing, Mich. (Corp. M. June '29)

LaPorte Water Works, Arthur Baker, Supt., Lake & Tyler Sts., LaPorte, Ind. (Corp. M. July '37)

Larkins, T. H., Supt. of Filtration, City Chemist, Box 497, 316 Thompson Ave., East Liverpool, Ohio (May '29)

Larson, Linne C., Asst. Engr., Dept. of Water & Power, 3425 Amesbury Rd., Los Angeles, Calif. (Apr. '36)

Larson, Thurston E., Chemist, Illinois State Water Survey, Urbana, Ill. (July '37)

Lasell, Fred B., Chemist, Metropolitan Utilities Dist., 3023 Bondesson St., Omaha, Neb. (Jan. '34)

Lassiter, Leroy Irving, San. Engr., Consolidated Board of Health, Wilmington, N. C. (May '26)

Lasso, Alfredo F., Ing. Civ., Presidente Roca 736, Rosario De Sta. Fe., R. Argentina (Sept. '17)

Latham, James K., Assoc., Howard K. Bell, Cons. Engrs., 731 McClelland Bldg., Lexington, Ky. (Oct. '39)

Lathrop, Thomas R., Asst. San. Engr., State Dept. of Health, Columbus, Ohio (Jan. '25)

Latta, John, *see* Northeastern Water & Elec. Service Corp.

Laudemann, Harry M., Chief Chemist, Water Supply Dept., Chesapeake & Ohio Ry. Co., 612 Ninth Ave., Huntington, W. Va. (Jan. '39)

Lauer, C. O., Pres. & Gen. Mgr., Gardiner Elec. Light & Water Co., Gardiner, Mont. (July '31)

Laughlin, Henry F., Research Chemist, Industrial Chemical Sales Co., 470 Park Ave., Tyrone, Pa. (Jan. '36)

Launer, Nelson M., Mgr., 2505 E. Whittier Blvd., Whittier, Calif. (Oct. '37)

Launer, R. E., *see* Hillside Distribution Co.

Lauten, Paul Z., Asst. Borough Engr., Zelienople Water Dept., 110 Oliver Ave., Zelienople, Pa. (Oct. '39)

Lauter, Carl J., Chief Chemist, Washington Filtration Plants, Dalecarlia Filter Plant, Washington, D. C. (Apr. '22)

Lautz, W. E., Secy. & Mgr., Pekin Water Works, Pekin, Ill. (Nov. '15)

Laux, Paul C., *see* Anderson, City of

Lavelle, John, Asst. Supt., Meters & Services, Bureau of Water Works & Supply, Box 3669 Terminal Annex, Los Angeles, Calif. (Oct. '32)

Law, Woodruff, Filter Plant Foreman, Baldwin Filtration Plant, 11322 Mt. Overlook Ave., Cleveland, Ohio (Jan. '40)

Lawing, O. T., P. O. Box 334, Greer, S. C. (July '35)

Lawlor, Joseph P., Pres., General Filter Co., Ames, Iowa (Jan. '36)

Lawrence, Frederick H., 145 W. Sharpnack St., Germantown, Philadelphia, Pa. (Mar. '24)

Lawrence, H. C., Water Supt., Powell Valley Rd. Water Dist., Route 14, Box 579, Portland, Ore. (Affil. Jan. '40)

Lawrence, R. E., Cons. Engr., Black & Veatch, Cons. Engrs., 4706 Broadway, Kansas City, Mo. (May '28)

Lawrence, Robert L., Jr., Supt. & Chief Engr., Water Works Dept., City Hall, Nashville, Tenn. (June '34)

Lawrence Water Dept., Frank E. Wiley, Supt., City Hall, Lawrence, Kan. (Corp. M. Feb. '27)

Lawson, Hugh C., Dist. Mgr., Rensselaer Valve Co., 743 Subway Terminal Bldg., Los Angeles, Calif. (Apr. '37)

Lawton, Ralph W., Civ. Engr., 137 N. Van Ness Ave., Los Angeles, Calif. (July '06) *Honorary M. '38.*

Layne & Bowler, Inc., J. G. Gordon, Jr., Pres., Memphis, Tenn. (Assoc. M. June '16)

Layne-Atlantic Co., R. R. Schweitzer, Chief Engr., 633 New Monroe Bldg., Norfolk, Va. (Assoc. M. Apr. '30)

Layport, Herbert, Supervisor, Water Dept., Dayton Power & Light Co., 30 Carson Ave., Dayton, Ohio (July '37)

Lea, William S., Cons. Engr., 1226 University St., Montreal, Que., Can. (Jan. '24)

Lead Industries Assn., F. E. Wormser, Secy., 420 Lexington Ave., New York, N. Y. (Assoc. M. Jan. '38)

Lead Lined Iron Pipe Co., Thomas E. Dwyer, P. O. Box 150, Wakefield, Mass. (Assoc. M. Oct. '98)

Leadite Co., Inc., The, George McKay, Jr., Pres., Girard Trust Company Bldg., Philadelphia, Pa. (Assoc. M. Feb. '10)

Learned, Albert P., Asst. Engr., Black & Veatch, Cons. Engrs., 4706 Broadway, Kansas City, Mo. (May '22)

Leavitt, William F., General Foreman, Fresno City Water Dept., 1926 Tuolumne St., Fresno, Calif. (Oct. '38)

Le Bosquet, M., Jr., 1309 Enquirer Bldg., Cincinnati, Ohio (July '35)

Lechner, Bernard J., Secy. & Treas., Comrs. of Water Works, 701 French St., Erie, Pa. (July '29)

LeClerc, Arthur B., Sales Engr., T. C. Heywood, 1408 Independence Bldg., Charlotte, N. C. (Jan. '40)

Ledbetter, Charles M., San. Engr., State Board of Health, Jackson, Miss. (Oct. '39)

Ledden, Ernest M., Secy. & Gen. Mgr., Sea Cliff Water Co., 244 Madison Ave., New York, N. Y. (Apr. '12)

Lee, Charles H., Cons. Hydr. Engr., 58 Sutter St., San Francisco, Calif. (Mar. '12)

Lee, Frank O., City Engr., St. Petersburg, Fla. (July '35)

Lee, L. L., *see* Miami Munic. Water Supply

Lee, Scott M., Supt., City Water Dept., 58 Newman Ave., Arcadia, Calif. (June '27)

Lee, W. S., Jr., Pres., W. S. Lee Engineering Corp., Power Bldg., Charlotte, N. C. (Jan. '36)

Leh, Willard, Asst. Engr., 1376 Perkiomen Ave., Reading, Pa. (Apr. '39)

Leisen, Theodore A., 8040 St. Paul Ave., Detroit, Mich. (June '04) *Vice-Pres. '12–'13, '17. Trustee '14–'16, '27–'29. President '18. Exec. Com. '19–'20. Director '36–'38. Honorary M. '38.*

Leland, Raymond I., Asst. San. Engr., Manteno State Hospital, Manteno, Ill. (Jr. M. Jan. '39)

Le May, Andy L., Water Supt., Oroville, Wash. (Jan. '39)

Lemert, R. C., Sales Agent, U. S. Pipe & Foundry Co., 2105 Bryand Bldg., Kansas City, Mo. (Oct. '39)

Lendall, Harry N., Prof., Engineering Dept., Rutgers College, New Brunswick, N. J. (Mar. '23)

Lenert, L. G., Regional Public Health Engr., Georgia State Dept. Public Health, Swainsboro, Ga. (Mar. '32) *Director '38–'36.*

Lenhardt, Laurence G., Gen. Mgr., Dept. of Water Supply, 735 Randolph St., Detroit, Mich. (June '20) *Fuller Award '40.*

Leon D., Ernesto, Chief of Water Works Div., Ministry of Public Works, Aptdo. No. 1404, Caracas, Venezuela, S. A. (Apr. '40)

Leonard, James M., Supt., Virginia & Gold Hill Water Co., Virginia City, Nev. (May '30)

Leonard, John S., Supt., Speedway Water Works, 5010 W. Tenth St., Indianapolis, Ind. (July '37)

Leonard, Stephen R., *see* Sherrill-Kenwood Water Com.

Leonard, W. V., San. Engr., Dist. of Health, Boise, Idaho (Apr. '39)

Lesslie, John N., Jr., Chemist, Water Dept., Salisbury, N. C. (Affil. Jan. '39)

Lester, John, Chemist, Box 590, Fernandina, Fla. (Jan. '39)

Leveque, Roland J., Supt. of Filtration, 809 Mortimer Ave., Fredericksburg, Va. (Apr. '38)

Leverin, Harald A., Chem. Engr., Mines Branch, Dept. of Mines, Ottawa, Ont., Can. (Jan. '36)

Levine, Max, Prof. in Charge, Dept. of Bacteriology, Iowa State College, Ames, Iowa (Nov. '21)

Levy, A. G., Engr. of Const. & Surveys, 2840 E. 132nd St., Cleveland, Ohio (May '10)

Levy, A. Zabdiel, Assoc. Engr., Bureau of Water Supply, 2605 N. Hilton St., Baltimore, Md. (Jan. '40)

Lewis, Albert W., Resident Mgr., U. S. Pipe & Foundry Co., 1150 E. 26th St., Cleveland, Ohio (Jan. '39)

Lewis, C. D., Water Supt., Ennis, Tex. (Oct. '39)

Lewis, Fred E., Filter Plant Operator, 707 Washington St., Huntingburg, Ind. (Affil. Oct. '38)

Lewis, Fred J., Dean, School of Eng., Kirkland Hall, Vanderbilt Univ., Nashville, Tenn. (Jan. '39)

Lewis, Geo. A., Hydrographer, Box 47, Independence, Calif. (July '34)

Lewis, J. E., Supt., Yorba Linda Water Co., Yorba Linda, Calif. (Oct. '29)

Lewis, John V., Dept. of Public Works, 54 Court St., Rochester, N. Y. (Feb. '21)

Lewis, Robert F., Reservoir Keeper-in-Charge, Bureau of Water Works & Supply, 1300 N. Beverly Drive, Beverly Hills, Calif. (Jan. '39)

Lewis, W. M., Dist. Mgr., Layne New York Co., 529 Market St., Camden, N. J. (Jan. '37)

Ley, Peter, Plant Supt., Jamaica Water Supply Co., 161-20—89th Ave., Jamaica, N. Y. (Jan. '36)

Libby, Frank D., Chemist, Kalamazoo Vegetable Parchment Co., Kalamazoo, Mich. (May '23)

Liffen, John James, Exec. Engr., Assoc. London Properties, Ltd., St. Ermins, Caxton St., Westminster, London, England (July '38)

Lilue, Enrique E., Asst. Engr., Ministry of Public Works, P. O. 486, Caracas, Venezuela, S. A. (Oct. '39)

Limb, John Mozart, Chief Chemist, Western Australia Govt. Railways, Midland Junction, W. Australia (Apr. '28)

Lincoln City Water & Light Dept., City Hall, Lincoln, Neb. (Corp. M. Mar. '19)

Lindeberg, Oscar F., Chief Operator, Water Works, Box 745, Miles City, Mont. (July '35)

Linderman, S. E., U. S. Pipe & Foundry Co., 2122 Koppers Bldg., Pittsburgh, Pa. (Jan. '37)

Lindsay, Alex, *see* Spokane, City of

Lindsey, Jack C., Water Operations Supt., Water Dept., 323 Co-City Bldg., Seattle, Wash. (Jan. '39)

Lindsten, H. C., Dist. Mgr., Wallace & Tiernan, Ltd., 301 Bank of Hamilton Bldg., Winnipeg, Man., Can. (Dec. '29)

Lingley, Ralph G., 9 Hadwen Lane, Worcester, Mass. (Mar. '29)

Link, Chas. L., Mgr., City Water Works, Elkhart, Ind. (Jan. '35)

Link, Erwin, Director, City Water Works, Lautenschlagerstrasse 21, Stuttgart N, Germany (June '29)

Lippincott, J. B., Cons. Engr., 714 W. Olympic Blvd., Los Angeles, Calif. (Jan. '36)

Lischer, Vance C., Engr. in Charge of Production, St. Louis County Water Co., 6600 Delmar, St. Louis, Mo. (Jan. '35) *Goodell Prize '38.*

Little, B. C., 94 Westminster Rd., Rochester, N. Y. (June '03) *Trustee '18–'20. President '21. Exec. Com. '22–'23. Secretary '26–'36. Secretary Emeritus '36–. Honorary M. '39.*

Little Rock Munic. Water Works, W. H. Williams, 425 W. Capitol Ave., Little Rock, Ark. (Corp. M. Jan. '38)

Livingston Water Dept., Ernest J. Bear, Supervisor of Water & Sewers, 107 Hillside Ave., Livingston, N. J. (Corp. M. Jan. '38)

Livingstone, Bard, *see* San Bernardino Board of Water Comrs.

Lloyd, Ernest B., Elgin Water Works, Elgin, Ill. (July '35)

Lloyd, J. M., Supt., Water Dept., City Hall, Tyler, Tex. (Oct. '39)

Lobley, Geo. W., 327 Maple St., Hammonton, N. J. (July '35)

Lochridge, Elbert E., Engr., Water Dept., P. O. Box 1867, Springfield, Mass. (July '06)

Lock Joint Pipe Co., F. F. Longley, Vice-Pres., Box 21, Ampere, N. J. (Assoc. M. Oct. '15)

Locke, J. Donald, Sales Mgr., Long Beach Iron Works, 2100 W. Anaheim St., Long Beach, Calif. (Oct. '38)

Lofton, H. M., Gen. Mgr. & Treas., Columbian Iron Works, Chattanooga, Tenn. (May '95) *Honorary M. '40.*

Logan, J. A., Asst. Prof., Civ. Eng. Dept., Univ. of Missouri, Columbia, Mo. (Apr. '40)

Logan, J. Ross, *see* Haddonfield, Borough Water Dept.

Lohman Bros., Inc., Frank Carlton, 1449 S. San Pedro St., Los Angeles, Calif. (Assoc. M. July '39)

Lohman, Rowland, Secy.-Treas., Lohman Bros., Inc., 1449 S. San Pedro St., Los Angeles, Calif. (July '40)

Lompoc Light & Water Dept., E. A. Vaughan, 118 N. H St., Lompoc, Calif. (Corp. M. Apr. '30)

London Public Utilities Com., C. Eastwood, Office Mgr., City Hall, London, Ont., Can. (Corp. M. Apr. '09)

Long Beach Water Com., Fred S. Porter, Gen. Mgr., 308 Public Utilities Bldg., Long Beach, Calif. (Corp. M. Oct. '31)

Long, James H., City Hall, Camden, N. J. (July '35)

Long, John S., Supt. of Water, Tampa, Fla. (May '33)

Long, V. V., V. V. Long & Co., 1300 Colcord Bldg., Oklahoma City, Okla. (Oct. '39)

Longley, F. F., Vice-Pres., Lock Joint Pipe Co., P. O. Box 21, Ampere, N. J. (July '07)

Longwell, John S., Chief Engr. & Gen. Mgr., East Bay Munic. Utility Dist., 512—16th St., Oakland, Calif. (Oct. '31)

Lordley, H. E., Plant Mgr., Filtration Plant, Rothesay Rd., Richmond, Va. (Jan. '36)

Los Angeles Dept. of Water & Power, H. A. Van Norman, Gen. Mgr. & Chief Engr., Bureau of Water Works & Supply, Box 3669 Terminal Annex, Los Angeles, Calif. (Corp. M. Apr. '10) *Director '40–'42.*

Losee, James R., Engr. & Supt., Tarrytown Water Works, 65 Main St., Tarrytown, N. Y. (July '28)

Louisville Water Co., Henry M. Gerber, Pres., 435 S. Third St., Louisville, Ky. (Corp. M. Apr. '09)

Lourie, G. E., Water Works Supt., P. O. Box 388, Bristol, Conn. (Sept. '23)

Lovejoy, J. W., Supt., Water & Light System, Laurens, S. C. (Apr. '30)

Lovejoy, Walter L., City Engr. & Water Supt., 611 Third St., Hoquiam, Wash. (Jan. '36)

Lovejoy, Wm. H., Supt. of Filtration, Crescent Hill Plant, Louisville Water Co., Louisville, Ky. (June '08)

Loveland, Chester H., Cons. Engr., 1010 Bank of Italy Bldg., San Francisco, Calif. (Oct. '24)

Loveland, City of, L. C. Osborn, City Engr., Loveland, Colo. (Corp. M. Apr. '26) *Director '35–'37.*

Lovell, Joe W., Murfreesboro Water Dept., P. O. 144, Murfreesboro, Tenn. (July '38)

Lowe, Geo. R., Jr., Secy. & Office Mgr., Columbus Water Works, Columbus, Ga. (Jan. '38)

Lowe, R. M., Water Supt., Burns Water Dept., Burns, Ore. (Apr. '40)

Lowe, Thomas M., Head Prof., Dept. of Civ. Eng., Alabama Polytechnic Institute, Auburn, Ala. (Jan. '37)

Lower, J. R., Chemist-in-Charge, Bucyrus Water Works, Bucyrus, Ohio (Sept. '27)

Lowther, Burton, Cons. Engr., 710 Colorado Bldg., Denver, Colo. (June '21) *Director '32–'34.*

Lozier, William S., Cons. Engr., 10 Gibbs St., Rochester, N. Y. (July '35)

Lubow, Louis A., Chemist, Water Dept., 1012 N. Gregson St., Durham, N. C. (Apr. '39)

Luby, William, *see* Troy Bureau of Water

Lucas, James H., York Village, Me. (July '35)

Lucas, Russell V., Chem. Engr., National Aluminate Corp., 1541 Lincoln Ave., St. Paul. Minn. (Apr. '40)

Luce, Arthur T., New York Water Service Corp., 90 Broad St., New York, N. Y. (Apr. '19)

Lucey, Patrick J., P. O. Box 2, Des Plaines, Ill. (July '39)

Luchessa, J. J., Mech. Supt., Miami Copper Co., P. O. Box 100, Miami, Ariz. (Jan. '40)

Ludlow, R. S., Supt., Kendallville Light & Water Dept., Kendallville, Ind. (Oct. '39)

Ludlow Valve Mfg. Co., Troy, N. Y. (Assoc. M. Mar. '82)

Ludwig, Harvey F., 1104 S. Gaffey Ave., San Pedro, Calif. (Jr. M. July '39)

Luebbers, Ralph H., Chem. Eng. Dept., Univ. of Missouri, Columbia, Mo. (Jan. '36)

Lugo, Miguel Viloria, Chief Engr. of Water System, Ministry of Public Works, Calle Real de Sabana Grande 245, Caracas, Venezuela, S. A. (Oct. '39)

Lugo, Thomas A., Draftsman, Dept. of Water & Power, Box 3669 Terminal Annex, Los Angeles, Calif. (Oct. '34)

Luippold, G. T., 405 N. Kilkes Drive, Los Angeles, Calif. (Feb. '24)

Lumbert, Wm. J., Supt., Scituate Water Dept., Greenbush, Mass. (July '35)

Lundberg, A. T., Chief Engr., Arlington County Water Dept., Court House, Arlington, Va. (Jan. '36)

Lundell, George R., Asst. Chemist & Bacteriologist, Fridley Filtration Plant, Minneapolis, Minn. (Aug. '27)

Lundquist, Harry, Repr., Neptune Meter Co., 5228 Brookview Ave., Edina, Minneapolis, Minn. (July '35)

Luther, Robert W., Plant Supt., Public Utility Com., Box 56, Elizabeth City, N. C. (Jan. '30)

Luthin, John C., Asst. Engr., Hydr. Div., California Railroad Com., 512 Scenic Ave., Piedmont, Calif. (Jan. '40)

Lutz, Howland C., Glen Rock, Pa. (July '39)

Lyden & McFarlin, R. Burke Lyden, P. O. 1294, Youngstown, Ohio (Assoc. M. Apr. '39)

Lyle, N. B., Scranton-Spring Brook Water Service Co., 135 Jefferson Ave., Scranton, Pa. (June '26)

Lyles, Joseph E., Chemist, Tampa Filtration Plant, Tampa, Fla. (Jan. '27) *Fuller Award '38.*

Lyman, James T., Supt. of Pipe Const., Bureau of Water Works & Supply, 201 Rose St., Los Angeles, Calif. (Apr. '36)

Lyman, William J., Southern Sales Mgr., National Cast Iron Pipe Co., Box 2542, Birmingham, Ala. (Jan. '36)

Lynch, James H., Jr., 2841 Parkwood Ave., Toledo, Ohio (July '37)

Lynchburg Foundry Co., Arthur Robert, Jr., Chief Engr., Lynchburg, Va. (Assoc. M. June '16)

Lynn, A. B., Mgr., South Pittsburgh Water Co., 238 Brownsville Rd., Pittsburgh, Pa. (May '30)

Lyon, A. S., Supt. of Public Works, Rocky Mount, N. C. (Dec. '23)

Lyon, Lawrence H., Supt., California Water & Telephone Co., 601 Lighthouse Ave., Pacific Grove, Calif. (Oct. '38)

Lysons, Edw., Supt., Water Dept., 429 Glen St., Snohomish, Wash. (July '40)

M. & H. Valve & Fittings Co., J. W. Spradley, Sales Mgr., Anniston, Ala. (Assoc. M. Feb. '30)

Mabbs Hydraulic Packing Co., John W. Mabbs, 431 S. Dearborn St., Chicago, Ill. (Assoc. M. May '23)

Mabee, William C., Chief Engr., Indianapolis Water Co., 113 Monument Circle, Indianapolis, Ind. (Dec. '24) *Director '36-'37. Diven Medal '38. Fuller Award '38.*

MacDonald, Alfred, *see* Wichita, City of

MacDonald, C. C., Secy., West Virginia Water Service Co., 814 Peoples Bank Bldg., Charleston, W. Va. (Oct. '29)

MacDonald, Edward, Comr., Water Dept., Melvindale, Mich. (Aug. '32)

MacDonald, Emmett, Mgr., Illinois Water Service Co., Sterling, Ill. (June '04)

MacDonald, W. E., City Water Works Engr., 330 Driveway, Ottawa, Ont., Can. (May '17)

MacDowell, Rollin F., Cons. San. Engr., 401 Chester-Twelfth Bldg., Cleveland, Ohio (July '37)

Mace, H. H., Barstow & Lefeber, 603 American Bldg., Cincinnati, Ohio (Oct. '37)

Mace, O. E., Chief Chemist, Pere Marquette Ry. Co., Wyoming Yards, Grand Rapids, Mich. (Aug. '33)

MacGregor, John Cameron, Mgr., Jewell Filter Co., Ltd., Mercantile Bldgs., Calcutta, India (Jan. '39)

MacKenzie, James T., Chief Metallurgist, American Cast Iron Pipe Co., Box 2603, Birmingham, Ala. (Jan. '40)

Mackie, Robert F., Cons. Chemist & Chem. Engr., Box 47, Bradford, Pa. (July '35)

MacLachlan, A., 1740 E. 12th St., Cleveland, Ohio (July '38)

MacLaren, James F., Gore & Storrie, Cons. Engrs., 1130 Bay St., Toronto, Ont., Can. (Jan. '35)

Macon Board of Water Comrs., Cliff T. Williamson, City Hall, Macon, Ga. (Corp. M. Apr. '29)

Macqueen, Philip O., 3031 Sedgwick St., N.W., Washington, D. C. (May '24)

Madison Suburban Utility Dist. of Davidson County, Madison, Tenn. (Corp. M. Apr. '38)

Maffitt, Dale L., Gen. Mgr., Des Moines Water Works, Des Moines, Iowa (Apr. '18)

Maffitt, Howard C., Cons. Chemist, 526—11th St., Des Moines, Iowa (Dec. '26)

Maffitt, M'Kean, Supt. Water Dept., Wilmington, N. C. (Dec. '22)

Maga, John A., San. Engr., California Water Service Co., 316 El Camino Real, San Mateo, Calif. (Jan. '40)

Maggs, Percy J., Waterworks Supt., Wetaskiwin, Alta., Can. (Jan. '37)

Magill, Rowland R., Cons. Chemist, 1520 Grace Ave., Lakewood, Cleveland, Ohio (Apr. '40)

Mahl, Carl E., 1022 N. 5th St., Ironton, Ohio (July '39)

Mahlie, Winfield S., Chemist in charge, Filtration Plant, Fort Worth, Tex. (Feb. '23)

Mahoney, Thomas H., Supt., Water Dept., 245 Broadway, Methuen, Mass. (Oct. '39)

Mailler, John P., Chief Engr., Northeastern Water & Elec. Service Co., 61 Broadway, New York, N. Y. (Apr. '39)

Main, T. C., Asst. Engr., Water Supt., Canadian National Railways, 458 Union Station, Winnipeg, Man., Can. (Jan. '37)

Malcolm, William Lindsey, Director, School of Civ. Eng., Cornell Univ., Ithaca, N. Y. (Mar. '34)

Malcor, W. E., Supt., Water Dept., 515 Sepulveda Blvd., Manhattan Beach, Calif. (Apr. '36)

Mallalieu, Willard, Jersey City Water Works, P. O. Box 188, Boonton, N. J. (Dec. '14)

Mallmann, Walter LeRoy, Dept. of Bacteriology, Michigan State College, East Lansing, Mich. (Jan. '38)

Malmö, Byggnadskontor, Alfred Jerden, Chief Engr., Malmö, Sweden (Corp. M. July '21)

Malone, Edward L., Cashier, Citizens Water Co., 78 McKennan Ave., Washington, Pa. (July '39)

Malone, J. R., Chemist, Durham Water Dept., 1312 N. Gregson St., Durham, N. C. (Oct. '39)

Malster, E. L., Mgr., York Water Co., York, Neb. (Jan. '40)

Mamrelli, Emil S., Jr. Civ. Engr., Los Angeles Aqueduct, Bureau of Water Works & Supply, Box 3669 Terminal Annex, Los Angeles, Calif. (Oct. '34)

Manahan, Elmer G., Cons. Engr., 35 Ridgeway St., Mount Vernon, N. Y. (June '09)

Manahan, Patrick, Supt., Water Works, Briarcliff Manor, N. Y. (May '24)

Manbert, Cal R., Const. Engr., East Bay Munic. Utility Dist., 512—16th St., Oakland, Calif. (Aug. '33)

Mangun, L. B., Chemist in Charge, Water Purif., Kansas City, Kan. (Feb. '20)

Manila Metropolitan Water Dist., Gregorio De Leon, Chief Engr., Manila, P. I. (Corp. M. July '37)

Mann, David A., Supt., Dept. of Public Service, Niagara Falls, N. Y. (Jan. '36)

Mann, Karl, *Water Works Engineering,* 24 W. 40th St., New York, N. Y. (Oct. '37)

Manock, Foster T., 912 Pershing Square Bldg., 448 S. Hill St., Los Angeles, Calif. (Nov. '32)

Mansfield, Myron G., Vice-Pres., Morris Knowles, Inc., 507 Westinghouse Bldg., Pittsburgh, Pa. (June '24)

Manson, A. B., Gen. Mgr., Public Utility Com., Stratford, Ont., Can. (Feb. '30)

Mara, Anthony, Supt. of Public Works, Township Parsippany Troy Hills, Boonton, R. D., N. J. (Apr. '39)

Marcel, Verain, Station de Recherches, Hydrologiques, 58 Bis Rue de la Commanderie, Nancy—M & M—, France (Jan. '35)

Marckmann, O. W., Marckmann & Williams, Inc., P. O. Box 3085, Seattle, Wash. (Apr. '38)

Marquardt, E., Pragerplatz 3-111, Berlin-Wilmersdorf, Germany (Apr. '37)

Marquis, J. K., Engr. in Charge of Plant, Spartanburg Water Works, R. #2, Chesnee, S. C. (July '30) *Director '38-'40.*

Mars, A. D., Jr., Mgr., Neptune Meter Co., Box 5210, Denver, Colo. (Dec. '26)

Marsden, Arthur B., Manchester Center, Vt. (July '35)

Marsh, John A., Chemist, Baldwin Filtration Plant, 11216 Fairmont Rd., Cleveland, Ohio (Apr. '37)

Marshall, L. A., Supt., Div. Filtration Plant, Division Ave. & W. 32nd St., Cleveland, Ohio (May '21)

Marston, Frank A., Cons. Engr., Metcalf & Eddy, Cons. Engrs., 1300 Statler Bldg., Boston, Mass. (Feb. '22)

Martin, Arthur, *see* Oil City Bureau of Water

Martin, Frank W., Supt. of Utilities, Munic. Power Plant, Hinsdale, Ill. (Oct. '34)

Martin, H. B., Supt., Municipal Com., Mohawk, N. Y., (Jan. '38)

Martin, Michael J., Chem. Engr., 395 Collins St., Melbourne C. 1, Australia (Jan. '36)

Martin, Miles H., Hydr. & San. Engr., West Virginia Water Service Co., Hinton, W. Va. (July '34)

Martin, Paul H., Sales Repr., Neptune Meter Co., 528 Hilltonia Ave., Columbus, Ohio (Oct. '38)

Martin, Phil. J., Jr., City Water Supt., 224 N. Highland Ave., Tucson, Ariz. (Mar. '31)

Martindale, R. H., Supt., Elec. Light & Water Works Dept., Sudbury, Ont., Can. (Sept. '29)

Martindale, R. W., Pacific Coast Mgr., U. S. Pipe & Foundry Co., 907 Monadnock Bldg., San Francisco, Calif. (Nov. '23)

Martinez-Ponte, J. Raf., Civ. & San. Engr., Norte 14 No. 139, Caracas, Venezuela, S. A. (July '30)

Martinez, Rolando A., Cons. Engr., San Rafael #106, Antes #12, Havana, Cuba (Dec. '27)

Martinez, Sergio S., Civ. Engr., Calle H No. 354 Vedado, Havana, Cuba (July '38)

Martinsen, Norman, Gen. Sanitation Inspector, Room 1402, Smith Tower, State Dept. of Health, Seattle, Wash. (Affil. Jan. '39)

Marzec, Edmund J., 3231—4th Ave., Sioux City, Iowa (Jan. '36)

Mason City Water Dept., C. B. Patchen, Supt., Mason City, Iowa (Corp. M. Jan. '37)

Massey, Carlton C., Town Mgr., Salem, Va. (Jan. '39)

Masterson, W. D., *see* San Antonio, City Water Board of

Mather, Edward K., Cons. Civ. Engr., 309-13 Western Bldg., Mitchell, S. D. (Nov. '29)

Matheson, D. H., 155 London St., S., Hamilton, Ont., Can. (May '34)

Mathews, Everett R., 102 W. Summit, Pierre, S. D. (May '34)

Mathews, F. Rockwell, Water Supt., Mount Kisco, N. Y. (Jan. '34)

Mathews, H. M., Supt., Water & Light Dept., Thomasville, Ga. (Oct. '39)

Mathews, L. R., Supt., Three Rivers Filtration Plant, Fort Wayne, Ind. (Jan. '35)

Mathews, W. W., 220 W. 44th Ave., Gary, Ind. (Nov. '25)

Mathieson Alkali Works, Inc., J. A. Kienle, Vice-Pres., 60 E. 42nd St., New York, N. Y. (Assoc. M. Mar. '20)

Matte, Hubert P. T., Commercial Engr., Worthington-Gamon Meter Co., Harrison, N. J. (July '13)

Matter, L. D., 2536 Lexington St., Harrisburg, Pa. (May '23)

Matthews, Emory C., Secy. & Treas., Board of Water Comrs., City Hall, Macon, Ga. (Jan. '40)

Matthews, J. C., R. C. Lennox & J. C. Matthews, 833 Architects & Builders Bldg., Indianapolis, Ind. (Jan. '38)

Matthews, William E., III, Pres., Alabama Water Service Co., Watts Bldg., Birmingham, Ala. (Jan. '37)

Mattinson, Frank W., Vice-Pres., Skenandoa Rayon Corp., 1201 Broad St., Utica, N. Y. (Jan. '39)

Mattoon, Stanley F., The Anderson-Mattoon Co., Ltd., 402-3 Board of Trade Bldg., 111 W. 7th St., Los Angeles, Calif. (May '30)

Mattson, K. C., Mgr., Chem. Dept., Griffin Chemical Co., 1925 E. Olympic Blvd., Los Angeles, Calif. (July '39)

Mattson, Walfrid T., Chemist & Bacteriologist, Hibbing Health Dept., 3220—2nd Ave., W., Hibbing, Minn. (Oct. '39)

Mau, Carl F., Research Engr., California Water Service Co., P. O. Box 1150, San Jose, Calif. (Jan. '37)

Mauch, Theo. C. M., Supt. of Pumping, Indianapolis Water Co., Indianapolis, Ind. (Dec. '24)

Mavis, Frederic T., Main Engineering Bldg., State College, Pa. (Oct. '25)

Maxwell, C. H., Supt. of Water, Colton, Calif. (Oct. '37)

Maxwell, Donald H., Cons. Engr., Alvord, Burdick & Howson, 1401 Civic Opera Bldg., Chicago, Ill. (Feb. '17)

Maxwell, George Earle, Supt., Public Utilities Com., 58 Peel St., Simcoe, Ont., Can. (Jan. '40)

Maxwell, Wm. A., Mgr., Toronto Township Waterworks, Cooksville, Ont., Can. (Jan. '39)

Maybrook Water Board, Fred Decker, Supt. of Public Works, Maybrook, N. Y. (Corp. M. Apr. '38)

Mayer, Edward B., Asst. Civ. Engr., Dept. of Water & Power, Box 3669

Terminal Annex, Los Angeles, Calif. (Oct. '29)

McAdam, S. Allen, City Engr., 369 N. 9th St., Lebanon, Pa. (Apr. '36)

McAfee, H. D., San. Engr., City Water Dept., City Hall, Corsicana, Tex. (Oct. '39)

McAlary, Allan, Supt. & Treas., Camden & Rockland Water Co., Box 151, Rockland, Me. (Apr. '22)

McAmis, James W., Supt. of Water Works, Greeneville, Tenn. (Sept. '21)

McAndrew, Frank J., Mgr., St. Joseph Water Co., 825 Francis St., St. Joseph, Mo. (Jan. '40)

McArthur, J. W., *see* Eugene Water Board

McArthur, L. S., Vice-Pres., Texas Water Co., 112 Baurline St., Fort Worth, Tex. (Oct. '39)

McBride, Samuel P., Chemist, Shenango Valley Water Co., Sharon, Pa. (Jr. M. July '39)

McBurnett, B. B., Water Supt., Chickasha, Okla. (Feb. '24)

McCaffrey, Wm. A., Supt. of Water Works, 191 E. 6th St., Oswego, N. Y. (June '20) *Director '39-'41.*

McCain, Curtis, *see* Delphi Water Works

McCall, R. G., Asst. San. Engr., West Virginia Health Dept., 1541 Lee St., Charleston, W. Va. (Affil. Jan. '39)

McCall, R. L., Engr., Water Dept., Utilities Bldg., Jacksonville, Fla. (Jan. '40)

McCambridge, J. H., *see* Burbank Public Service Dept.

McCann, Gilbert D., Engr., Maywood Mutual Water Co., 3, 6155 Heliotrope Ave., Maywood, Calif. (Oct. '39)

McCarthy, Cal, Asst. Supt., North Jersey District Water Supply Com., Wanaque, N. J. (Oct. '35)

McCarthy, J., Chemist, Racine Water Dept., 1129 E. Lexington Blvd., Milwaukee, Wis. (July '37)

McCarthy, Owen A., Supt. of Water Supply, Michigan & Schaefer Rd., Dearborn, Mich. (Mar. '27)

McClane, J. Huston, The Hercules Powder Co., Jacksonville, Fla. (Oct. '37)

McCleary, E. L., Supt., Silverton Water Com., Silverton, Ore. (June '34)

McClees, Joseph H., Water Meter Repairman-in-Charge, Bureau of Water Works & Supply, 468 Ducommun St., Los Angeles, Calif. (July '38)

McClenahan, W. T., Sr. Civ. Engr., San. Dist. of Chicago, 6218 University Ave., Chicago, Ill. (Apr. '14)

McClintock, H. C., *see* Boulder Water Dept.

McCord, C. M., *see* Memphis Board of Light & Water Comrs.

McCormack, J. W., Asst. Engr., Detroit Dept. of Water Supply, 735 Randolph St., Detroit, Mich. (Jan. '38)

McCormick, J. H., American Tank Service Co., Dallas, Tex. (Oct. '39)

McCoy, J. W., Supt. of Filtration, Munic. Light & Water Plant, Madisonville, Ky. (Jan. '40)

McCrady, MacHarvey, Chief of Labs., Quebec Province Bureau of Health, 89 Notre Dame, E., Montreal, Que., Can. (Apr. '16)

McCreery, T. W., Salesman, U. S. Pipe & Foundry Co., 1711 Webb Crawford Bldg., Birmingham, Ala. (Jan. '36)

McCrory, Dean E., Sales Repr., Pennsylvania Salt Mfg. Co., 541 Union Trust Bldg., Pittsburgh, Pa. (Apr. '39)

McCurdy, H. S. R., Chief Engr., Philadelphia Suburban Water Co., 762 Lancaster Ave., Bryn Mawr, Pa. (July '27)

McCutcheon, Johnson, *see* North Jersey Dist. Water Supply Com.

McDaniel, B. J., City Engr., City Hall, Big Spring, Tex. (July '38)

McDiarmid, David Middleton, Sr. Exec. Engr., Malayan Public Works Service, Kuala Lumpur, Federated Malay States (July '38)

McDivitt, Wm. A., Pres., Freeport Water Co., 331—4th St., Freeport, Pa. (July '39)

McDonald, A. Y., Mfg. Co., L. A. Montgomery, Sales Mgr., P. O. Box 508, Dubuque, Iowa (Assoc. M. Jan. '40)

McDonald, Bryan E., Supt., Water Dept., Ozona, Tex. (Oct. '39)

McDonald, F. L., State San. Engr., Arkansas State Health Dept.,, State Capitol, Little Rock, Ark. (July '39)

McDonald, Norman G., Gore & Storrie, Cons. Engrs., 1130 Bay St., Toronto, Ont., Can. (Jan. '35)

McDonnell, Robert E., Burns & McDonnell Engineering Co., 107 W. Linwood Blvd., Kansas City, Mo. (May '13)

McDonough, Howard, *see* Reading Bureau of Water

McDowell, D. Y., Malvern Water Works, Malvern, Ark. (July '35)

McDowell, Francis B., Jr., Asst. Mgr. & Engr., Comrs. of Public Works, Charleston, S. C. (June '29)

McEllhiney, William Alva, Pres., J. P. Miller Artesian Well Co., 9 S. Clinton St., Chicago, Ill. (Jan. '38)

McEntee, Harry E., Supt., Water Softening Plant, 1215 S. State St., Ann Arbor, Mich. (July '38)

McEwen, Jasper A., Civ. Engr. Draftsman, Bureau of Water Works & Supply, Box 3669 Terminal Annex, Los Angeles, Calif. (Apr. '36)

McFarland, Charles T., Mech. Engr., Munic. Service Co., Dwight Bldg., Kansas City, Mo. (Apr. '40)

McFarlane, Robert, Supt., Pumping & Filtration Plant, City Water Works, Brandon, Man., Can. (Jan. '36)

McFaul, W. L., City Engr. & Mgr. of Water Dept., City Hall, Hamilton, Ont., Can. (Mar. '24)

McGarigle, J. A., 137 Wellington St., W., Toronto, Ont., Can. (Jan. '33)

McGauhey, P. H., Assoc. Prof. of San. Eng., Virginia Polytechnic Institute, Blacksburg, Va. (July '38)

McGeehin, D. J., Supt., Hazleton Water Co., 38 S. Church St., Hazleton, Pa. (July '35)

McGhee, D. W., Mgr., Pasco Water Dept., Pasco, Wash. (Jan. '35)

McGonigale, Wm. J., Treas., Inter-State Water Co., 203 N. Jackson St., Louisville, Ky. (Apr. '12)

McGowan, Hugh, Jr., Supt., Pumping Station, 15 McKean St., Freehold, N. J. (Jan. '38)

McGowan, M., Supt., Water Dept., Cathlamet, Wash. (Apr. '40)

McGrath, Charles P., Supt. of Maintenance & Const., Dept. of Water Supply, 3451 Orleans St., Detroit, Mich. (Apr. '40)

McGrath, Louise E., (Miss), Vice-Pres., Booth Chemical Co., P. O. Box 203, Elizabeth, N. J. (July '39)

McGraw, Charles E., Irrigation & Const. Engr., % R. Hardesty Mfg. Co., 3033 Blake St., Denver, Colo. (Jan. '40)

McGuire, M. H., *see* McMinnville Water & Light Dept.

McGuire, Orla E., Asst. Engr., Bureau of Eng., Michigan Dept. of Health, Lansing, Mich. (Jan. '39)

McGuire, Thomas M., Mgr. of Water Dept., Plymouth, Wis. (Jan. '40)

McIntyre, F. J., Director, Columbus Water & Chemical Testing Lab., 144 E. Lakeview Ave., Columbus, Ohio (July '39)

McIntyre, P. T., Jr. Engr., Los Angeles Dept. of Water & Power, 315 N. Adams St., Glendale, Calif. (Oct. '34)

McKague, John J., 220 Pine St. Freeport, N. Y. (Apr. '38)

McKay, George, Jr., Pres., The Leadite Co., Girard Trust Co. Bldg., Philadelphia, Pa. (Apr. '30)

McKay, W. M., Johns-Manville Sales Corp., 116 New Montgomery St., San Francisco, Calif. (Jan. '38)

McKee, Wm., *see* St. Marys Public Utilities Com.

McKenzie, L. B., *see* Ocala Water Dept.

McLaughlin, H. L., Salesman, National Meter Co., 1310 Race St., Denver, Colo. (Mar. '26)

McLaughlin, Philip L., San. Engr., West Virginia Water Service Co., 814 Peoples Bank Bldg., Charleston, W. Va. (July '28)

McLaughlin, Richard M., Director Div. of Sanitation, Westchester County Health Dept., 148 Martine Ave., White Plains, N. Y. (Jan. '39)

McLean, E. P., Engr., Moultrie, Ga. (Apr. '38)

McLean, J. D., *see* Timmins, Corp. Town of

McLean, R. F., Supt. of Water Dept., Walla Walla, Wash. (June '28)

McLean, W. A., Cons. Engr., 67 Yonge St., Toronto, Ont., Can. (July '35)

McLure, J. H., City Engr., Chester, S. C. (Apr. '38)

McManamna, Theodore L., 373 Wartley Rd., London, Ont., Can. (Jan. '34)

McMillan, J. A., Mgr., Water Works, Charlottetown, P.E.I., Can. (Mar. '27)

McMillan, L. S., Supt., Water Works, Raeford, N. C. (July '35)

McMinnville Water & Light Dept., M. H. McGuire, Mgr., McMinnville, Ore. (Corp. M. July '34) *Director '39-'41.*

McMorrow, Bernard J., San. Engr., Board of Health, Hilo, T. H. (Jan. '38)

McMullen, R. S., 409 First National Bank Bldg., Carbondale, Pa. (July '35)

McMurry, W. F., 405 City Hall, Tulsa, Okla. (Apr. '36)

McNamara, Leo G., Salesman & Chemist, Layne-New York Co., Inc., 400 Highland Terrace, Orange, N. J. (July '39)

McNamee, Robert L., Shoecraft, Drury & McNamee, State Savings Bank Bldg., Ann Arbor, Mich. (June '26)

McNeice, L. G., *see* Orillia Water, Light & Power Com.

McNeill, Johnnie L., Supt., Light & Water Dept., Lumberton, N. C. (Aug. '26)

McNicol, J. C., *see* Lake Forest Water Dept.

McPhail, Alex. L., Supt., Water Works Com., St. Catharines, Ont., Can. (Jan. '35)

McPherson, C. E., Water Comr., Water Dept., City Hall, Little Falls, Minn. (July '39)

McQueen, Leo E., Supt., Board of Public Works, Coldwater, Mich. (Apr. '23)

McRae, J. P., McRae Engineering Equipment, Ltd., 11 King St., W., Toronto, 2, Ont., Can. (Jan. '24)

McReynolds, B. B., Supt., Water Div., Dept. of Public Utilities, 18-20 S. Nevada Ave., Colorado Springs, Colo. (May '14)

McWane Cast Iron Pipe Co., W. P. Cox, Gen. Sales Mgr., Box 2601, Birmingham, Ala. (Assoc. M. Apr. '23)

McWilliams, D. E., Mgr., Roaring Creek Water Co., Box 17, Shamokin, Pa. (Mar. '22)

Mead, Daniel W., Civ. Engr., 120 W. Gorham St., Madison, Wis. (Apr. '89) *Honorary M. '30.*

Mead, Frank F., Civ. Engr., 357 Orizaba Ave., Long Beach, Calif. (Oct. '39)

Meadows, J. O., San. Engr., J. T. Donald & Co., Ltd., 1181 Guy St., Montreal, Que., Can. (June '20)

Meaney, Wm. J., Jr., Head, Water Purif. Dept., 971—16th St., N.E., Cedar Rapids, Iowa (Oct. '34)

Medbery, Hiram Christopher, Water Purif. Engr., San Francisco Water Dept., Millbrae, Calif. (Oct. '37)

Medford Water Com., Robert A. Duff, Supt., City Hall, Medford, Ore. (Corp. M. Mar. '30)

Meeker, W. L., Supt., Water Works Co., Clinton, Iowa (Oct. '28)

Meffert, W. H., Florida Lime Products Co., Box 478, Ocala, Fla. (July '35)

Meissner, William A., Jr., Sales Mgr., Farnan Brass Works Co., 1104 Center St., Cleveland, Ohio (July '38)

Meites, H. L., Supt. of Water, 101 City Hall, Chicago, Ill. (July '35)

Melbourne & Metropolitan Board of Works, A. E. Kelso, Engr. of Water Supply, 110 Spencer St., Melbourne, C. 1., Victoria, Australia (Corp. M. Jan. '36)

Mellen, Arthur F., Supt. of Filtration, Columbia Heights Filtration Plant, Minneapolis, Minn. (Mar. '15)

Mellon, T. A., Pres., Kensington Water Co., 2112 Oliver Bldg., P.O. Box 1114, Pittsburgh, Pa. (June '03)

Melvin, Howard H., Gen. Mgr., Millville Water Co., 209-11 High St., Millville, N. J. (Jan. '39)

Memphis Board of Light & Water Comrs., C. M. McCord, Director Water Div., P. O. Box 421, Memphis, Tenn. (Corp. M. Apr. '09)

Meng, B. B., Supt. of Water Works, Winnsboro, S. C. (Apr. '29)

Mengel, Carl W., Director, Public Works & Service, City Hall, Greensboro, N. C. (Jan. '38)

Menzenhauer, Fred C., 1321 Boulevard East, West New York, N. J. (Jr. M. Jan. '38)

Menzies, D. B., Provincial San. Engr., 218 Administration Bldgs., Edmonton, Alta., Can. (Jan. '37)

Merckel, F. G., Wallace & Tiernan Co., Inc., P. O. Box 178, Newark, N. J. (Jan. '21)

Meredith, E. C., Asst. San. Engr., State Dept. of Health, 119 State Office Bldg., Richmond, Va. (Jan. '37)

Merfeld, F. A., *see* Citizens Utilities Co.

Merkel, Paul P., Anal. & Cons. Chemist, 1528 N. 11th St., Reading, Pa. (Jan. '37)

Merrick, Clyde R., Water Supply Contractor, 3712 Brill St., Indianapolis, Ind. (Jan. '37)

Merrill, Arthur J., *see* Johnson City Water Dept.

Merrill, William H., Supt. of Water Dept., Three Forks, Mont. (Jan. '40)

Merriman, William H., Supervisor of Distr., Water Dept., 1202 E. Mohawk Ave., Tampa, Fla. (Jan. '36)

Merritt, Emmett, Supt., City Water Plant, Beaumont, Tex. (Apr. '36)

Merritt, Will D., Supt., Water Dept. & City Engr., Mount Airy, N. C. (Oct. '30)

Merritton Public Utilities Com., Fred Barwell, Supt., Water Works Dept., Merritton, Ont., Can. (Corp. M. June '26)

Merryfield, Fred, Asst. Prof. Civ. Eng., Oregon State College, Corvallis, Ore. (May '34)

Merz, H. S., Supt. of Water Dept., 3227 Westgate Parkway, Rockford, Ill. (Oct. '37)

Meseck, W. T., *see* Austin Board of Water, Elec., Gas & Power Comrs.

Messer, Richard, San. Engr., State Dept. of Health, 615 State Office Bldg., Richmond, Va. (Sept. '11)

Mexico, Banco Nacional Hipotecario Urbano y de Obras Publicas, S. A., Jose Mendez Valazquez, Av. FCO. 1 Madero No. 32, Mexico, D. F., Mexico (Corp. M. Oct. '37)

Meyer, Ed, Water Works Supt., Hespeler, Ont., Can. (Apr. '32)

Meyer, Ernest L. H., *see* Glens Falls Board of Water Comrs.

Meyer, H. R. J., Civ. Engr., Supply and Purifying Section, St. Louis Water Div., 1640 S. Kingshighway Blvd., St. Louis, Mo. (Jan. '35)

Meyer, J. Edward, *see* Citizens Water Supply Co. of Newtown

Meyerherm, Charles F., Albert F. Ganz. Inc., 511—5th Ave., New York, N. Y. (Jan. '22)

Miami Munic. Water Supply, L. L. Lee, City Mgr., Miami, Fla. (Corp. M. Apr. '40)

Miceli, Peter C., 625 Harvard St., Wilmette, Ill. (July '39)

Michael, A. C., Asst. Mech. Engr., 8300 W. Warren Ave., Dearborn, Mich. (Jan. '38)

Michael, A. M., Supt., Water Dept., Mebane, N. C. (Aug. '26)

Michaels, A. P., 3446 Golfview Blvd., Orlando, Fla. (Aug. '24) *Director '31–'33.*

Michau, R., Asst. Engr. to Gen. Supt., Paris City Water & Sewerage Dept., 17, Boulevard Delessert, Paris, France (Mar. '27)

Middletown Water Dept., Samuel C. Cannon, Supt., Middletown, Conn. (Corp. M. June '21)

Midland Public Utilities Com., Roy S. King, Box 548, Midland, Ont., Can. (Corp. M. Mar. '27)

Midland Water Dept., Paul Stegeman, Supt., Midland, Mich. (Corp. M. Jan. '40)

Miguel, Agustin Otero, Engr., Havana Water Works, Estacion Bombas Palatino, Cerro, Havana, Cuba (Jan. '40)

Mikesell, C. C., Sales Repr., Johns-Manville Sales Corp., 1360 Prospect Ave., Long Beach, Calif. (Oct. '39)

Miles, Harry B., General Supt., Bureau of Water, 712 Washington St., Utica, N. Y. (June '24)

Milford, T. H., Asst. San. Engr., State Dept. of Public Health, Montgomery, Ala. (Apr. '38)

Milford Water Co., J. W. Kay, Supt., Milford, Mass. (Corp. M. July '35)

Millar, John H., San. Engr., Boone County Health Dept., Madison, W. Va. (Affil. Jan. '38)

Millar, Robert S., Mgr., Water Co., Wichita, Kan. (May '38)

Millard, August B., Fort Meade, Md. (Apr. '38)

Miller, Alden W., Sales Engr., 1833 N. 13th Ave., Phoenix, Ariz. (Oct. '34)

Miller, Arthur P., San. Engr. in Charge, Interstate San. Dist. No. 1, U. S. Public Health Service, Sub-Treasury Bldg., New York, N. Y. (Sept. '20)

Miller, F. C., City Chemist, Trinidad, Colo. (July '35)

Miller, H. I., Vice-Pres., Pacific Water Works Supply Co., Atlantic St. Terminal, Pier A, Seattle, Wash. (Jan. '28)

Miller, Louis L., Engr., Somerville Water Co., Raritan, N. J. (Jan. '40)

Miller, Paul E., Water Chemist, Harmon Color Works, Inc., 550 Belmont Ave., Haledon, N. J. (Jan. '39)

Miller, Russell, Supt., Water & Light Plant, Amory, Miss. (Apr. '30)

Miller, S. J., Water Engr., Northern Indiana Power Co., 500 Traction Terminal Bldg., Indianapolis, Ind. (Jan. '37)

Miller, Wallace T., Supt., Board of Water Comrs., Municipal Bldg., Ossining, N. Y. (Aug. '33)

Miller, Warren C., City Engr., City Hall, St. Thomas, Ont., Can. (Feb. '23)

Milliken, W. W., *see* Santa Monica, City of

Millikin, William H., Asst. City Supt., Denver Munic. Water Works, P. O. Box 629, Denver, Colo. (Apr. '40)

Milliren, M. E., *see* Du Bois Bureau of Water

Mills, C. J., Jr., Mgr., Munic. Water Works, Waynesboro, Ga. (Jan. '37)

Mills, H. L., Salesman, American Cast Iron Pipe Co., 206 S. Beattie St., Helena, Mont. (Apr. '40)

Mills, W. Stuart, Salesman, Peacock Bros., Ltd., 510 Federal Bldg., Richmond St., W., Toronto, Ont., Can. (July '39)

Millville Water Co., Alfred Brandriff, Millville, N. J. (Corp. M. Jan. '16)

Miner, Nelson A., Jr. Engr., City Water Works, City Hall, Dallas, Tex. (Oct. '39)

Mineral Wells City Water Works, Owen Boarman, Water Comr., Mineral Wells, Tex. (Corp. M. Apr. '40)

Minkus, Alexander J., 30 N. Whitney St., Hartford, Conn. (Oct. '37)

Minneapolis Com. of Water Works, Desmond F. Pratt, Chairman, Minneapolis, Minn. (Corp. M. June '20)

Minor, Edward Eastman, Gen. Mgr., New Haven Water Co., New Haven, Conn. (May '12)

Minor, Lynn O., Treas. & Mgr., Kankakee Water Co., 132 S. Dearborn Ave., Kankakee, Ill. (Jan. '40)

Miracle, Ralph, Asst. Mgr., Elk River Concrete Products Co., 502 Power Bldg., Helena, Mont. (Apr. '40)

Mishawaka City Water & Elec. Plant, Austin R. Klein, Supt., City Hall, Mishawaka, Ind. (Corp. M. Dec. '37)

Mississippi Lime Co., C. C. Schmoeller, Vice-Pres., Alton, Ill. (Assoc. M. Oct. '39)

Mitchell, Earl T., Supt. of Filtration, Paducah Water Works, Paducah, Ky. (July '40)

Mitchell, George W., Dist. Mgr., Wallace & Tiernan Co., 917 Terminal Sales Bldg., Seattle, Wash. (July '34)

Mitchell, Louis, Dean, College of Applied Science, Syracuse Univ., Syracuse, N. Y. (Mar. '32)

Mitchell, T. S., Comr. of Utilities, City Hall, Greenville, Tex. (July '35)

Mitchell, William F., Engr., Pennsylvania Salt Mfg. Co., 134 W. Albemarle Ave., Lansdowne, Pa. (Jan. '39)

Mitchell, Wm. H., Dist. Sales Mgr., The Permutit Co., 407 S. Dearborn St., Chicago, Ill. (Jan. '35)

Mitchell, William P., Local Mgr., Public Service Co. of Indiana, Crawfordsville, Ind. (Jan. '37)

Mittelstaedt, R. E., *see* Sacramento Div. of Water

Moat, Charles P., Chemist, State Board of Health, 2 Colchester Ave., Burlington, Vt. (Jan. '15)

Moffat, A. G., Secy., Sewerage & Water Board of New Orleans, 526 Carondelet St., New Orleans, La. (July '37)

Moffat, H. A., Industrial Chemical Sales, 801 Washington Blvd. Bldg., Detroit, Mich. (Apr. '38)

Moggio, William A., Div. of Public Health, Univ. of North Carolina, Chapel Hill, N. C. (Jr. M. Jan. '40)

Mohlman, Floyd W., Chief Chemist, San. Dist. of Chicago, 910 S. Michigan Ave., Chicago, Ill. (Oct. '21)

Moir, Donald, Montevideo Waterworks Co., Ltd., 20-24, Moorgate, London, E. C. 2, England (June '24)

Molina, Eduardo, Civ. Engr., Wagner 18, Guadalupe Inn, Villa A. Obregon, D. F., Mexico (Jan. '37)

Moline Water Works, A. E. Anderson, Supt., City Hall, Moline, Ill. (Corp. M. Jan. '16)

Molis, Walter W., Supt. of Distr., City Water Works, 710 Iowa Ave., Muscatine, Iowa (July '35)

Monro, Albert, Supt., Pipe Const., Los Angeles Dept. of Water & Power, 141 N. Meyler St., San Pedro, Calif. (Oct. '30)

Monroe Avenue Water Dist., Geo. H. Bliven, 2010 Monroe Ave., Rochester, N. Y. (Corp. M. Oct. '37)

Monroe, H. L., Supt. of Water Works, Pontiac, Mich. (July '19)

Monsanto Chemical Co., I. J. Stanley, Jr., 1700 S. Second St., St. Louis, Mo. (Assoc. M. Apr. '37)

Montgomery Board of Water Comrs., Edward Ayers, Supt. of Public Works, Montgomery, N. Y. (Corp. M. Apr. '38)

Montgomery, J. H., Mgr., North Little Rock Water Co., 117 E. 3rd St., North Little Rock, Ark. (Oct. '38)

Montgomery, James M., Cons. Engr., Hoover & Montgomery, Engrs., 306 W. 3rd St., Los Angeles, Calif. (Jun. '27)

Montoulieu, Henry J., Civ. Engr., Calle B. No. 508, Entre 21 y 23, Vedado, Havana, Cuba (Nov. '11)

Moon, C. D., *see* New Jersey Water Co.

Moon, Philip G. G., Engr. & Gen. Mgr., Bournemouth Gas & Water Co., 136, Old Christchurch Rd., Bournemouth, England (Oct. '32)

Moore, Carl C., Sales Repr., Pittsburgh Equitable Meter Co., 243 N. 5th St., Columbus, Ohio (Apr. '39)

Moore, Charles E., Mgr., City of Roanoke, Water Dept., 311 Avenham Ave., Roanoke, Va. (Oct. '23)

Moore, Edward W., Asst. Prof. of San. Chemistry, Harvard Graduate School of Eng., 7A Pierce Hall, Harvard Univ., Cambridge, Mass. (Oct. '38)

Moore, G. W., State Dept. of Health, Terminal Bldg., Rochester, N. Y. (Apr. '37)

Moore, George S., Supt. of Water & Light, Albemarle, N. C. (Apr. '24)

Moore, Herbert, Engr., 904 S. Layton Blvd., Milwaukee, Wis. (July '28)

Moore, M. B., Supt., Woodlawn Water Co., Aliquippa, Pa. (July '39)

Moore, Russell B., Cons. Engr., K. P. Bldg., Indianapolis, Ind. (Jan. '28)

Moore, Thomas F., Salesman, General Chemical Co., 15119 Lake Ave., Lakewood, Ohio (Apr. '39)

Moore, W. D., Pres., American Cast Iron Pipe Co., Birmingham, Ala. (Jan. '38)

Moorman, R. L., Cons. Engr., Bowling Green, Ky. (July '39)

Morales, Luis, Cons. Engr., Morales & Co., Compostela 158, Havana, Cuba (Jan. '39) *Director '41-'42.*

Moran, John W., Supt. of Water Works, 10 Procter St., Gloucester, Mass. (Jan. '36)

Morehouse, Wallace W., Director, Dept. of Water, Room 308, U. B. Annex, Dayton, Ohio (Jan. '23) *Director '39.*

Morey, David, Jr., San. Engr., 417-418 Praetorian Bldg., Dallas, Tex. (May '23)

Morgan, E. A., Wellsburg, W. Va. (Affil. Jan. '39)

Morgan, Mel, Water Supt., Water Dept., Enumclaw, Wash. (Apr. '39)

Morrill, Arthur B., Engr. of Sewage Treatment, 9300 W. Jefferson Ave., Detroit, Mich. (Oct. '25)

Morris, D. B., C. B. Lyon & Bro., Inc., 2303 Hampden Ave., St. Paul, Minn. (Oct. '35)

Morris, Earle H., *see* West Virginia Public Service Com.

Morris, Samuel B., Dean, School of Eng., Stanford Univ., Calif. (June '20) *Director '31-'33. Diven Medal '33.*

Morrison, H. H., Dist. Sales Engr., The Permutit Co., 415 Provident Bldg., Chattanooga, Tenn. (July '35)

Morrison, James E., Purif. Engr., Seattle Water Dept., Route #1, Box 173, Renton, Wash. (Oct. '39)

Morrison, R. J., Chief Meter Inspector, Dallas City Water Works, Dallas, Tex. (Oct. '39)

Morrison, Thomas J., 373 Grand Ave., Rochester, N. Y. (Mar. '34)

Morrow, Ben S., Engr. & Gen. Mgr., Bureau of Water Works, 209 City Hall, Portland, Ore. (Apr. '26) *Director '33-'35.*

Morrow, Guy, Mgr., Peoria Water Works Co., Peoria, Ill. (June '30)

Morse, W. C., *see* Seattle Water Dept.

Morse, Howard Scott, Vice-Pres. & Mgr., Indianapolis Water Co., 113 Monument Circle, Indianapolis, Ind. (Sept. '25) *Director '31, '35.*

Mortensen, F. C., Major, Sanitary Corps, Station Hospital, Fort Leavenworth, Kan. (Apr. '40)

Morton, Roy J., Vanderbilt Univ., School of Medicine, Nashville, Tenn. (July '35)

Moses, Chas. S., *see* Delavan Water Com.

Moses, D. V., Chem. Engr., Ammonia Dept., E. I. Du Pont de Nemours & Co., Box 1537, Charleston, W. Va. (July '39)

Moses, Howard E., Chief Engr., State Dept. Health, 1522 N. Second St., Harrisburg, Pa. (Apr. '22)

Moses, John W., Sales Repr., Buffalo Meter Co., 9330 Gorman Ave., Cleveland, Ohio (Jan. '39)

Mosier, Cortland, Supt., Spring Valley Water Works & Supply Co., 147 Main St., Spring Valley, N. Y. (Dec. '29)

Mosley, M. E., Asst. Mgr., San Gabriel Valley Water Service, 242 E. Garvey Ave., El Monte, Calif. (Oct. '38)

Moss, N. V., Chief Clerk, Water Dept., City Hall, Amarillo, Tex. (July '39)

Moss, Roscoe, Roscoe Moss Co., 4360 Worth St., Los Angeles, Calif. (Oct. '35)

Mott, Kennon, *see* Nehi Corp.

Mottern, R. J., *see* Bristol, City of

Moullet, Louis F., Mech. Engr., East Bay Munic. Utility Dist., 512 16th St., Oakland, Calif. (May '26)

Mount Airy City Water Dept., F. G. Doggett, Supt., Mount Airy, N. C. (Corp. M. July '37)

Mount Holly Water Co., Arthur D. Cross, Mgr. & Vice-Pres., 84 Mill

St., Mount Holly, N. J. (Corp. M. Apr. '24)

Mt. Morris Water Dept., C. E. Kellogg, Supt., Mt. Morris, N. Y. (Corp. M. Apr. '39)

Mount, W. R., *see* Edmonton, City of

Mountain View Suburban Water Co., T. C. Binkley, Supt., Mountain View, Calif. (Corp. M. Oct. '37)

Mowder, Clyde L., Chief Engr., Los Angeles Investment Co., 1033 S. Broadway, Los Angeles, Calif. (Oct. '35)

Mower, Stanley E., 923 University Block, Syracuse, N. Y. (Apr. '37)

Mowlam, Wm. V., City Engr., Box 593, Corsicana, Tex. (Oct. '39)

Mowrey, J. Hase, Mgr. of Public Utilities, 202 S. Second St., Chambersburg, Pa. (July '25)

Mowry, Robert B., Dist. Mgr., Wallace & Tiernan Co., Belleville, N. J. (July '37)

Muddiman, J. B. C., Asst. Chemist, Water Dept., 197 Washington Ave., Kingston, N. Y. (July '39)

Mudge, John Rexford, Pres. & Gen. Mgr., Chemical Equipment Corp. of California, 414 Arroyo Drive, South Pasadena, Calif. (May '24)

Muegge, O. J., Asst. San. Engr., State Board of Health, 656 Crandall St., Madison, Wis. (May '25)

Mueller Brass Co., F. L. Riggin, Pres. & Gen. Mgr., Port Huron, Mich. (Assoc. M. June '27)

Mueller Co., Frank H. Mueller, Director of Research & Development, Decatur, Ill. (Assoc. M. Mar. '82)

Mueller, H. M., Mgr., Industrial Div., The McKays Co., 473 N. Cleveland Ave., St. Paul, Minn. (July '38)

Mull, Charles H., Mgr., Vista Irrigation Dist., Vista, Calif. (Oct. '38)

Mullen, B. J., Chief Plant Engr., 8300 W. Warren Ave., Dearborn, Mich. (Jan. '38)

Muller, A. B., *see* Southern California Water Co.

Mullergren, Arthur L., Cons. Engr., 202 Fairfax Bldg., Kansas City, Mo. (Oct. '19)

Mulligan, D. G., Mountain States Inspection Bureau, P. O. Box 1740, Denver, Colo. (Mar. '28)

Multiplex Mfg. Co., Multiplex Bldg., Berwick, Pa. (Assoc. M. May '16)

Multnomah Home Water Dist., E. Riley, Supt., Multnomah, Ore. (Corp. M. Apr. '39)

Mundy, Ambros, Supt., Middlesex Water Co., Woodbridge, N. J. (Mar. '14)

Munn, Harvey T., Hydr. Engr., National Board of Fire Underwriters, 222 W. Adams St., Chicago, Ill. (Mar. '20)

Munroe, Walter C., Chief Engr., Anne Arundel County San. Com., Old High School Bldg., Annapolis, Md. (Jan. '24)

Murchison, H. A., Salesman, The Permutit Co., P. O. Box 1201, Bradenton, Fla. (Apr. '37)

Murdoch, John H., Jr., Attorney, Uniontown Water Co., American Water Works & Elec. Co., 50 Broad St., New York, N. Y. (May '30)

Murdoch, William J., San. Engr., 1123 Cornell St., Pittsburgh, Pa. (Jan. '36)

Murnane, David J., Water Engr., Municipal Offices, Singapore, Straits Settlements (Nov. '29)

Murphy, A. R., Civ. Engr., Fountain City, Tenn. (Apr. '11)

Murphy, Frank J., Supt., Div. of Meters, Milwaukee Water Works, City Hall, Milwaukee, Wis. (May '16)

Murphy, J. P., Foreman, Water Dept., 119 King St., La Crosse, Wis. (Oct. '39)

Murphy, James P., Filter Plant Supt., 119 Reformatory Ave., Pontiac, Ill. (Apr. '38)

Murphy, William A., Mayor, Village of Irvington, N. Y. (Oct. '39)

Murray, A. L., *see* General Utilities Co., Ltd.

Murray, Alban J. M., Control Chemist, Johnson & Johnson Pty. Ltd., 54 Sydney St., Willoughby, N.S.W., Australia (Jan. '40)

Murray, E. M., Mathieson Alkali Works, Service Ware House, Jacksonville, Fla. (July '35)

Murray, Joseph J., Water Comr., Water Dept., 184 Washington St., Newton, Mass. (Oct. '39)

Murray, Ray M., Structural Engr., 626—36th Ave., Seattle, Wash. (Feb. '22)

Muscatine City Water Works, Robert Roach, Laurel Bldg., Muscatine, Iowa (Corp. M. May '21)

Muser, E. Fred, Mgr., Chester Water Service Co., Fifth & Welsh Sts., Chester, Pa. (Dec. '20)

Musser, H. P., Pres., Mullens Water Works, 709 Security Bldg., Charleston, W. Va. (Oct. '22)

Mussi, A. P., Water Works Engr., 310 Terminal Bldg., Rochester, N. Y. (July '35)

Myers, E. L., Myers, Noyes & Forrest, Cons. Engrs., 2204 Tower Petroleum Bldg., Dallas, Tex. (July '35)

Myers, Edward, Supt. Water Dept., Maryville, Mo. (Apr. '40)

Myers, Henry C., Chief Operator, California Water & Telephone Co., Route 1, Box 120, Palm City, Calif. (July '38)

Myers, James M., *see* Kenosha Water Dept.

Myers, Wm. G., City Engr., Municipal Bldg., Harrisonburg, Va. (July '39)

Nalefski, L. A., Chemist, 1594 W. Macon St., Decatur, Ill. (Jan. '36)

Nasi, Kaarlo William, Public Health Engr., Territorial Dept. of Health, Juneau, Alaska (Jan. '38)

Nassau County Dept. of Health, J. L. Barron, Director of Div. of Sanitation, Bar Bldg., Mineola, L. I., N. Y. (Corp. M. Apr. '40)

National Aluminate Corp., J. A. Holmes, 6216 W. 66th Pl., Chicago, Ill. (Assoc. M. June '26)

National Lead Co., Titanium Div., G. B. Coale, Mech. Supt., P. O. Box 58, South Amboy, N. J. (Corp. M. July '37)

National Meter Co., N. J. Kenny, 4207 First Ave., Brooklyn, N. Y. (Assoc. M. Mar. '82)

National Soap & Chemical Co., A. H. Leifgren, 110—5th Ave., S. E., Minneapolis, Minn. (Assoc. M. July '39)

National Tube Co., W. L. Schaeffer, 1902 Frick Bldg., Pittsburgh, Pa. (Assoc. M. May '21)

National Water Main Cleaning Co., Clinton Inglee, Pres. & Gen. Mgr., 30 Church St., New York, N. Y. (Assoc. M. July '06)

Naylor, Frank, Filter Plant Operator, Board of Water Comrs., Frost Lane, Peekskill, N. Y. (Jan. '39)

Neal, Edward D., *see* East Aurora, Village of

Neenah City Water Works, Arthur Hanson, Chemist, Neenah, Wis. (Corp. M. Apr. '39)

Nehi Corp., Kennon Mott, General Production Dept., Columbus, Ga. (Corp. M. July '38)

Neighbour, H. M., Supt., Water & Sewers, City Hall, Santa Ana, Calif. (Oct. '37)

Neill, Clayton B., Div. Mgr., California Water & Telephone Co., 439 Tyler St., Monterey, Calif. (Oct. '35)

Neill, Harold D., Sales Repr., American Rolling Mill Co., Middletown, Ohio (Apr. '39)

Neis, R. E., City Director, Monroe, Mich. (Jan. '37)

Nelson, Ben. O., City Engr., Pullman, Wash. (Jan. '40)

Nelson, Earl C., *see* Dover Water Comrs.

Nelson, Fred B., 950 Woodycrest Ave., New York, N. Y. (July '07)

Nelson, H. Lloyd, Eastern Sales Mgr., U. S. Pipe & Foundry Co., Broad & Chestnut Sts., Philadelphia, Pa. (May '30) *Director '39.*

Nelson, Herbert M., Acting Purchasing Agent, East Bay Munic. Utility Dist., 512—16th St., Oakland, Calif. (Oct. '39)

Nelson, Jos. S., *see* Sioux Falls Water Works

Nelson, Nick L., City Engr., Sioux City Water Works, 2521 Douglas St., Sioux City, Iowa (Oct. '37)

Nelson, Olaf, Chairman, Board of Trustees, Council Bluffs City Water Works, Council Bluffs, Iowa (Jan. '35)

Nelson, Samuel B. S., Asst. Field Engr., Bureau of Water Works & Supply, 251 S. Larchmont Blvd., Los Angeles, Calif. (Oct. '34)

Nenzel, Peter A., Engr., California Water & Telephone Co., 485 California St., San Francisco, Calif. (Oct. '38)

Neptune Meter Co., 50 W. 50th St., New York, N. Y. (Assoc. M. Aug. '94)

Nesin, Benjamin C., Chemist-in-Charge, Mt. Prospect Lab., 355 Park Pl., Brooklyn, N. Y. (Oct. '37)

Nevling, J. B., Secy.-Treas., Clearfield Water Co., Clearfield, Pa. (Oct. '14)

New Jersey State Water Policy Com., George S. Burgess, Chairman, 19 Washington St., East Orange, N. J. (Corp. M. Apr. '36)

New Jersey Water Co., C. D. Moon, Mgr., 610 Station Ave., Haddon Heights, N. J. (Corp. M. Jan. '27)

New Mexico Power Co., O. B. Summers, Mgr., Santa Fe, N. M. (Corp. M. Mar. '24)

New Mexico Power Co., Agua Pura Div., E. A. Bradner, Mgr., Las Vegas, N. M. (Corp. M. May '09)

New Toronto Public Utilities Com., A. H. R. Thomas, Supt. of Water Works, New Toronto, Ont., Can. (Corp. M. Jan. '33)

New Westminster, City of, Andrew Hunter, Water Works Supt., 8th St. & 8th Ave., New Westminster, B. C., Can. (Corp. M. Jan. '36)

Newell, Clark, Supt. of Water Works, Provo, Utah (July '28)

Newhall, H. Lester, 6122 Gladys Ave., College Hill, Cincinnati, Ohio (June '29)

Newkirk, S. F., Jr., Engr. & Supt., Board of Water Comrs., 18 W. Jersey St., Elizabeth, N. J. (Oct. '27) *Director '39–'41.*

Newland, S. H., State Health Dept., 225 Albany, Shreveport, La. (Oct. '39)

Newlands, James A., San. Engr., 11 Laurel St., Hartford, Conn. (Oct. '14)

Newman, Alfred C., Asst. State Director, State Board of Health, Jacksonville, Fla. (July '37)

Newsom, Reeves, Engr.-Consultant, 500 Fifth Ave., New York, N. Y. (Nov. '18) *Director '36–'38, '40. President '39.*

Nichols, M. Starr, Chemist, State Lab. of Hygiene, Madison, Wis. (Jan. '26)

Nickel, Jack B., Asst. Engr., State Board of Health, 201 State House Annex, Indianapolis, Ind. (Jan. '37)

Nicklin, H. S., *see* Guelph, City of

Nicklis, James A., Dist. Repr., Wallace & Tiernan Co., Inc., 1697 Wyandotte Rd., Columbus, Ohio (Apr. '39)

Nicol, Thomas Bruce, Civ. Engr., 341, Pitt St., Sydney, N. S. W., Australia (July '33)

Niemeyer, H. W., Supt. of Distr. & Transport., Indianapolis Water Co., 113 Monument Circle, Indianapolis, Ind. (Apr. '30)

Nisbet, Geo. A., Supt., Water Dept., P. O. Box 554, Palisade, Colo. (Oct. '34)

Nix, J. N., *see* Cullman City Light & Water Plant

Noble, Milford S., Supt., Water Dept., 145 Hawthorne Ave., Palo Alto, Calif. (Apr. '31)

Noble, Ralph E., 10140 Rhodes Ave., Chicago, Ill. (Mar. '27)

Noguera, Gustavo, Apartado 1509, Bogota, Colombia, S. A. (Apr. '38)

Nolan, Dan C., Jr., Lyceum Bldg., Tarrytown, N. Y. (Apr. '36)

Norcom, George D., Cons. San. Engr. & Chemist, Red Bank, N. J. (June '21)

Nordell, Eskel, Chemist, The Permutit Co., 330 W. 42nd St., New York, N. Y. (Apr. '37)

Noreus, Robertson E., Filter Plant Supt., Northwest Paper Co , Cloquet, Minn. (Oct. '38)

Norman, Clifford, Supt., Bedford Water Works, City Hall, Bedford, Ind. (Jan. '40)

Norman, Earl E., Supt., Dept. of Public Utilities, City Hall, Kalamazoo, Mich. (Sept. '24)

Norris, G. M., Supt. of Distr., Water Dept., Wichita Falls, Tex. (Oct. '39)

Norris, M. Alvin, Chemist, Orlando Utilities Com., Box 1060, Orlando, Fla. (Feb. '27)

North Bay, City of, G. E. Elnor, City Foreman, City Hall, Ferguson St., North Bay, Ont., Can. (Corp. M. Jan. '37)

North Creek Water Dist., Kenneth Davis, Supt., North Creek, N. Y. (Corp. M. July '40)

North Jersey Dist. Water Supply Com., Johnson McCutcheon, Business Mgr., Raymond Dam, Wanaque, N. J. (Corp. M. Oct. '34)

North York, Township of, G. H. Baker, Water Works Supt., Willowdale, Ont., Can. (Corp. M. Feb. '32)

Northeastern Water & Elec. Service Corp., John Latta, 61 Broadway, New York, N. Y. (Corp. M. Jan. '33)

Northern Indiana Public Service Co., E. D. Anderson, Service Mgr., 5265 Hohman Ave., Hammond, Ind. (Corp. M. Jan. '36)

Northington, K. V., Supt., Water, Ballinger, Tex. (July '35)

Northrop, Guy C., Gen. Sales Mgr., Hydraulic Development Corp., 50 Church St., New York, N. Y. (Oct. '33) *Director '36, '37.*

Northrop, L. E., Mgr., Los Angeles Branch Office, Neptune Meter Co., 701 E. Third St., Los Angeles, Calif. (Sept. '29)

Norton, John F., The Upjohn Co., Kalamazoo, Mich. (May '26)

Noyes, A. J., *see* Deming Water Dept.

Nuebling, Edward, Civ. Engr., 525 W. 238th St., Riverdale, New York, N. Y. (Mar. '25)

Nunn, Henry E., Supt. of Water Works, Van Buren, Ark. (Oct. '34)

Nussbaumer, Newell L., Nussbaumer & Clarke, Inc., Engrs., 327 Franklin St., Buffalo, N. Y. (May '34)

Nutting, H. C., Pres., The H. C. Nutting Co., 4120 Davis Lane, Cincinnati, Ohio (Apr. '40)

Nutting, H. C., Testing Engrs., 4120 Davis Lane, Cincinnati, Ohio (Assoc. M. Sept. '33)

Nutting, N. C., Local Mgr., California Water Service Co., 308 S. Catalina Ave., Redondo Beach, Calif. (Sept. '33)

Oberly, H. T., Supt. of Public Works, St. Petersburg, Fla. (Oct. '39)

Obreiter, Jos. W., *see* Bloomfield, Town of

O'Brien, Denis F., A. P. Smith Mfg. Co., East Orange, N. J. (Jan. '35) *Director '31–'39, '41–'43. Honorary M. '55.*

Ocala Water Dept., L. B. McKenzie, Supt., Water & Light Dept., 512 Orange Ave., Ocala, Fla. (Corp. M. Apr. '38)

Ockershausen, Richard W., General Chemical Co., 105 W. Madison St., Chicago, Ill. (Apr. '37)

O'Connor, Philip J., 821 Kenilworth Ave., S. E., Warren, Ohio (Feb. '22)

Oconomowoc Water Dept., John W. Bolson, Supt., Oconomowoc, Wis. (Corp. M. June '29)

O'Day, Geo. P., Dist. Sales Repr., James B. Clow & Sons, 2452 Superior Viaduct, Cleveland, Ohio (Apr. '39)

O'Dell, Wilson H., Supt. of Public Works, 38 Lapham Park, Webster, N. Y. (Jan. '37)

O'Donnell, J. J., Supt., Water Dept., Bossier City, La. (Oct. '39)

Odor, W. Ray, Sales Mgr., Lynchburg Foundry Co., Lynchburg, Va. (Jan. '39)

Oeffler, W. A., Supt., Jasonville Water Co., 120 S. Lawton St., Jasonville, Ind. (Jan. '37)

Oelkers, Carl L., City Engr., City Hall, North Tonawanda, N. Y. (Apr. '37)

Oelklans, Walter G., Supt., Munic. Water Works, 101 S. Main St., St. Charles, Mo. (Apr. '40)

Offutt, F. M., Supt., Williamson Water Dept., Williamson, W. Va. (July '35)

Ogborn, Courtney M., 148 State St., Johnstown, Pa. (Apr. '37)

Ogden, John B., Mgr., New Jersey Water Service Co., 3 Paterson Ave., Little Falls, N. J. (July '38)

Ogden, William H., Vice-Pres., South Bay Consolidated Water Co., 60 Glen St., Glen Cove, N. Y. (July '35)

Oglebay, G. J., *see* Public Service Co. of Indiana

Ohio Salt Co., The, H. M. Olson, Prom. Engr., 171 Longue Vue Drive, Mt. Lebanon, Pittsburgh, Pa. (Assoc. M. Oct. '37)

Ohland, Harold M., Hydr. Engr., Water Dept., 22 City Hall, Jersey City, N. J. (July '37)

Ohlmacher, Joseph C., Director, State Health Lab., Vermillion, S. D. (Jan. '40)

Ohrt, Frederick, *see* Honolulu Board of Water Supply

Oil City Bureau of Water, Arthur Martin, Oil City, Pa. (Corp. M. July '34)

Oke, E. E. W., Mgr., Public Utilities Com., Cochrane, Ont., Can. (July '34)

Olean Board of Water Comrs., Joseph E. Rehler, Olean Water Dept., City Hall, Olean, N. Y. (Corp. M. Apr. '29)

O'Leary, Frederick J., West Coast Engr., The Barrett Co., 1136 S. Hayworth Ave., Los Angeles, Calif. (Oct. '34)

Olin, Hubert Leonard, Prof. of Chem. Eng., Univ. of Iowa, Iowa City, Iowa (Apr. '40)

Oliver, George T., Engr., Antioch & Walnut Creek, Pittsburg, Calif. (Oct. '37)

Olsen, A. K., Supt., Creston City Water Works, Creston, Iowa (Jan. '35)

Olsen, Fred J., Supt., Palatine Water Dist., 255 S. W. Breyman Ave., Portland, Ore. (Apr. '40)

Olsen, Harry *see* California Oregon Power Co.

Olsen, William C., Cons. Engr., Raleigh, N. C. (Dec. '21)

Olson, Oscar E., Jr. Civ. Engr., Bureau of Water Works & Supply, Box 3669 Terminal Annex, Los Angeles, Calif. (Apr. '37)

Olson Pehr, Jr. Engr., Los Angeles Bureau of Water Works & Supply, 4330 Bakman Ave., North Hollywood, Calif. (Jan. '35)

Olson, W. M., Supt. of Filtration, Lake & Michigan Aves., Wilmette, Ill. (Apr. '26)

Omaha Metropolitan Utilities Dist., Utilities Bldg., Harney at 18th St., Omaha, Neb. (Corp. M. Apr. '12)

O'Mealia, F. J., Supt., Water Dept., Le Roy, N. Y. (Jan. '36)

Omega Machine Co., L. E. Harper, Secy., 4010 Penn, Kansas City, Mo. (Assoc. M. Jan. '30)

O'Neill, Chris, Supt. of Water, Lake Geneva, Wis. (Feb. '30)

O'Neill, John H , Louisiana State Board of Health, New Orleans, La. (Apr. '25)

Ongerth, Henry J., Asst. San. Engr., Bureau of San. Eng., 1911-B Berryman St , Berkeley, Calif. (Oct. '39)

O'Nial, William O., Technical Officer, Filtration & Water Softening Pty., Ltd., 395 Collins St., Melbourne C.1, Australia (Jan. '36)

Oppermann, Richard H., Librarian, United Gas Improvement Co., 1401 Arch St., Philadelphia, Pa. (Jan. '30)

Orchard, William J., San. Engr., P. O. Box 178, Newark, N. J. (Aug. '17) *Director '36–'38. Honorary M. '37.*

O'Reilly, A. R., 1416 Rose Virginia Rd., Reading, Pa. (May '25)

Orillia Water, Light & Power Com., L. G. McNeice, Water Works Engr., Orillia, Ont., Can. (Corp. M. Apr. '34)

Orlando Public Utilities Com., M. W. Brown, Gen. Mgr., Orlando, Fla. (Aug. '33)

Ornstein, Georg, 10 E. 40th St., New York, N. Y. (Jan. '28)

Orth, Robert F., Johns-Manville Sales Corp., 1000 Market St., St. Louis, Mo. (July '35)

Osborn, L. C., *see* Loveland, City of

Osborn, L. M., Johns-Manville Sales Corp., 608—16th St., Oakland, Calif. (Jan. '38)

Osborn, Rex R., *see* Vancouver Water Dept.

Osborne, James Q., Dist. Mgr., De Laval Steam Turbine Co., 706—3rd Ave., Seattle, Wash. (Jan. '28)

Oshawa Public Utilities Com., G. F. Shreve, Gen. Mgr. & Secy., 100 Simcoe St., S., Oshawa, Ont., Can., (Corp. M. Jan. '33)

Oswego Dept. of Water, Myron D. Stone, Oswego, N. Y. (Corp. M. June '21)

Ottawa, City of, W. E. Mac Donald, Transportation Bldg., Ottawa, Ont., Can. (Corp. M. Mar. '33)

Ouellette, Lloyd J., Head Acct., Detroit Dept. of Water Supply, 735 Randolph St., Detroit, Mich. (Jan. '40)

Outzen, Andrew N., Detroit City Gas Co., Detroit, Mich. (Aug. '23)

Overholt, G. T., New York Sales Agent, U. S. Pipe & Foundry Co., 71 Broadway, New York, N. Y. (Oct. '39)

Overstreet, Ralph M., 1317 S. 4th St., Louisville, Ky. (Jan. '27)

Oviatt, Geo. R., Supt. & Gen. Mgr., Smethport Water Co., Smethport, Pa. (Jan. '39)

Owego Water Works, Arthur B. Stiles, Owego, N. Y. (Corp. M. Apr. '14)

Owen, Marvin H., Engr. in Charge of Operation, Los Angeles Dept. of Water & Power, 11147 La Maida St., North Hollywood, Calif. (Apr. '33)

Owens, George W., Mgr., Pipe, Valves & Fittings Dept., Ducommun Corp., 219 S. Central Ave., Los Angeles, Calif. (Jan. '33)

Owens, J. E., Asst. Water Supt., Henderson, Tex. (Oct. '39)

Owings, Noble L., Asst. Engr., Washington Suburban San. Dist., Riverdale, Md. (Jan. '23)

Ozark Chemical Co., E. W. Douglass, Chem. Engr., P. O. Box 499, Tulsa, Okla. (Assoc. M. Jan. '40)

Ozone Processes, Inc., Stanley Jenks, Director of Trade Relations, 1500 Walnut St., Philadelphia, Pa. (Assoc. M. Jan. '40)

Pacific States Cast Iron Pipe Co., P. O. Box 18, Provo, Utah (Assoc. M. Oct. '27)

Paducah Water Works, Lois Sutherland, Treas., Paducah, Ky. (Corp. M. Jan. '34)

Page, Blaine, 107 S. Franklin St., Shawano, Wis. (July '35)

Page, George C., Engr., Kennicott Water Softener Co., Ltd., Wolverhampton, England (June '30)

Pain, Herbert, Phillips & Pain, 31, Rue de la Vanne, Montrouge, Seine, France (Mar. '25)

Paine, G. G., *see* Everett Water Dept.

Painter, Carl Elliott, Vice-Pres. & Cons. Engr., Waterworks Equipment Co., Salt Lake City, Utah (Mar. '24)

Paisley, Peter P., Asst. Chemist, City of Toronto, 324 Markham St., Toronto, Ont., Can. (Jr. M. Jan. '39)

Paitovi, Antonio, Rivadavia 3772, Buenos Aires, Argentina (July '19)

Palisades Interstate Park Com., W. H. Gee, Bear Mountain Park, Iona Island, N. Y. (Corp. M. Jan. '35)

Palm Springs Water Co., A. F. Hicks, Pres., Palm Springs, Calif. (Corp. M. Oct. '37)

Palmer, F. F., City Engr., Box 486, Forsyth, Mont. (July '34)

Palmer, Henry Austin, Water Works Engr., The Causeway, Staines, Middlesex, England (May '30)

Palmer, R. M., Chem. Engr., 373 Fourth Ave., New York, N. Y. (Apr. '30)

Papps, George, Research Chemist, 302 W. 40th St., New York, N. Y. (Jr. M. Jan. '40)

Pardee Engineering Co., Howard J. Pardee, 3915—29th St., Long Island City, N. Y. (Assoc. M. Mar. '30)

Pardee, Howard J., San. Engr., 151 W. 105th St., New York, N. Y. (Mar. '30)

Park, J. H., City Mgr., City Hall, Compton, Calif. (Jan. '39)

Parker, Francis L., *see* Parker Laboratory

Parker, J. A., Supt. of Water Plant, Sylacauga, Ala. (July '35)

Parker, J. C., Supt., Public Utility Com., Main & Martin Sts., Elizabeth City, N. C. (Jan. '39)

Parker Laboratory, Francis L. Parker, Cons. Chemist, 40 Broad St., Charleston, S. C. (Corp. M. Jan. '39)

Parkinson, Eugene, Supt., Water Works, Box 294, Port Credit, Ont., Can. (Jan. '40)

Parks, C. A., Johns-Manville Sales Corp., 743 Henry Bldg., Seattle, Wash. (May '38)

Parks, James A., Detroit Dept. of Water Supply, 8300 W. Warren Ave., Dearborn, Mich. (Oct. '35)

Parks, W. H., Bennettsville, S. C. (July '35)

Parks, W. J., Jr., Supt., Watersheds, Asheville, Swannanoa, N. C. (Aug. '29)

Parlett, Russell C., Water Chemist, Illinois Central R. R., 135 E. 11th Pl., Chicago, Ill. (Apr. '37)

Parranto, Wm. A., *see* St. Paul Board of Water Comrs.

Parsons, Norman W., County San. Engr., New Cumberland, W. Va. (Oct. '34)

Pasadena Water Dept., Morris S. Jones, Chief Engr. & Gen. Mgr., 319 City Hall, Civic Center, Pasadena, Calif. (Corp. M. Oct. '24)

Passolt, A. A., Supt., Newnan Water & Light Com., Newnan, Ga. (May '25) *Fuller Award '39.*

Patch, Clifford, Bangor Water Board, P. O. Box 276, Bangor, Me. (Apr. '40)

Patchen, C. B., *see* Mason City Water Dept.

Pate, Carl L., 110 S. Pine, Nowata, Okla. (Oct. '38)

Paterson, A. B., Pres., New Orleans Public Service, Inc., 317 Baronne St., New Orleans, La. (July '37)

Paterson, William, The Paterson Eng. Co., Ltd., Windsor House, Kingsway, London, W.C.2, England (Nov. '24)

Patitz, G. J., Cons. Engr., Standard Brands, Inc., 595 Madison Ave., New York, N. Y. (Oct. '23)

Patrick, J. G., Chemist, West Virginia Pulp & Paper Co., Luke, Md. (June '30)

Patten, G. H., Supt., Village of Rockville Center, 50 Powell Ave., Rockville Center, L. I., N. Y. (Oct. '38)

Patterson, E. Curtis, Jr., Chemist, Citizens Water Co., 68 Leet St., Washington, Pa. (July '39)

Patterson, J. W., Div. Mgr., Northeastern Water & Elec. Service Corp., Water St., Skowhegan, Me. (Oct. '38)

Patterson, James N., Chemist, 323 King St., Santa Cruz, Calif. (Oct. '35)

Patterson, Richard L., City Engr. & Supt. of Water Dept., Newport Beach, Calif. (Sept. '28)

Patterson, W. E., Chief Chemist, G. F. Sterne & Sons, Ltd., Brantford, Ont., Can. (Jan. '36)

Patton, C. S., Sales Mgr., Alco Products Div. of American Locomotive Co., 30 Church St., New York, N. Y. (May '30)

Patton, David H., Dist. Engr., Johns-Manville Sales Corp., 101 Marietta St., Atlanta, Ga. (Oct. '34)

Paul, Marcel, Pres., Societe de Pont-a-Mousson, Chateau R'Enval, Boite Postale No. 2 a Brive, (Correze), France (Feb. '27)

Paul, Thomas, Chemist & Operator, Water Dept., Bradenton, Fla. (July '39)

Paulette, R. J., Paulette & Wilson, Cons. Engrs., 1006 Kansas Ave., Topeka, Kan. (Feb. '27)

Paxton-Mitchell Co., James L. Paxton, Jr., 27th & Martha Sts., Omaha, Neb. (Assoc. M. Jan. '36)

Payne, Fred S., 1294 N. Beverly Drive, Beverly Hills, Calif. (Jan. '36)

Payne, Gwynne, Filter Plant Operator, 505 Church St., Spencer, W. Va. (Affil. Jan. '40)

Payne, Thomas L., Jr. San. Chemist, Detroit Water Bureau, 8300 W. Warren Ave., Dearborn, Mich. (Jan. '40)

Peabody, James R., 905 Heyburn Bldg., Louisville, Ky. (Dec. '24)

Pearl, Emanuel H., Box 421, Greensburg, Pa. (Jan. '37)

Pearse, Langdon, San. Engr., San. Dist. of Chicago, S. O. Bldg., 910

S. Michigan Ave., Chicago, Ill. (Feb. '13)

Pearson, J. F., Supt., Water & Light Plant, 52 S. Middleton St., Orangeburg, S. C. (Feb. '29)

Peart, J. W., *see* St. Thomas Public Utilities Com.

Pease, Maxfield, 4614 Prospect Ave., Cleveland, Ohio (July '35)

Peck, Ermon M., Cons. Engr., 260 Edgewood St., Hartford, Conn. (July '07)

Peck, H. S., Comr. #2, Supt. of Water Dept., Court House, Fort Smith, Ark. (July '35)

Peck, W. O., *see* Dunkirk Board of Water Comrs.

Pedersen, H. V., Supt. of Water Works, Municipal Bldg., Marshalltown, Iowa (Mar. '22) *Director '33-'35.*

Pedley, Frank B., Water Supt., East La Verne Rd., Pomona, Calif. (Nov. '32)

Peerless Pump Division, E. W. Pierce, Sales Mgr., Box 493, Massillon, Ohio (Assoc. M. June '27)

Peirce, Walter A., Mgr., Water Dept., 2335 Carmel Ave., Racine, Wis. (June '22) *Director '33-'34, '39-'40.*

Peirson, A. G., Supt., Weston Public Utilities Com., Weston, Ont., Can. (Feb. '23)

Peirson, Nat. D., Peirson & Whitman, Cons. Engrs., Security Bank Bldg., Raleigh, N. C. (Jan. '40)

Pelton, G. Dorr, Dept. Engr., Water Dept., City Hall, Topeka, Kan. (Oct. '38)

Pelton Water Wheel Co., The, C. G. Crawford, 2929—19th St., San Francisco, Calif. (Assoc. M. Oct. '35)

Pennichuck Water Works, William F. Sullivan, Pres., Nashua, N. H. (Corp. M. Oct. '14)

Pennsylvania Salt Manufacturing Co., N. E. Bartlett, Vice-Pres., 1000 Widener Bldg., Philadelphia, Pa. (Assoc. M. June '03)

Pensinger, L. C., & Son, John L. Pensinger, 1332 Oak St., Kansas City, Mo. (Assoc. M. Apr. '40)

Pequegnat, Marcel, Supt., Kitchener Water Com., Kitchener, Ont., Can. (Feb. '24)

Perez G., Gustavo, Asst. Engr., Cuartel Viejo a Pineda No. 31, Caracas, Venezuela, S. A. (Apr. '40)

Perkins, J. L., High Point, N. C. (July '35)

Perkins, Percy M., Asst. Mech. Engr., Dept. of Public Works, 601 Water Board Bldg., Detroit, Mich. (Affil. Jan. '39)

Perlas, J. C., Asst. Supt. of Filtration, Metropolitan Water Dist., Manila, P. I. (Jan. '40)

Permutit Company, The, 330 W. 42nd St., New York, N. Y. (Assoc. M. Mar. '14)

Perrine, Charles D., Operating Engr., Public Service Co. of Indiana, Indianapolis, Ind. (Jan. '37)

Perry, Aubrey H., Dist. Engr., Dept. of Pensions & National Health, Box 1012, Vancouver, B.C., Can. (Mar. '31)

Perry, F. M., Supt., Augusta Road, Water & Sewer Sub-Dist., Box 801, Greenville, S. C. (July '37)

Perry, Henry O., Elec. Worker, Detroit Dept. of Water Supply, 8300 W. Warren Ave., Dearborn, Mich. (Oct. '39)

Perryman, John M., Engr., R. D. Cole Mfg. Co., Newnan, Ga. (Jan. '40)

Persons, J. T., *see* Central Power & Light Co.

Peterborough Utilities Com., R. L. Dobbin, Gen. Mgr., 223 Aylmer St., Peterborough, Ont., Can. (Corp. M. May '11)

Peters, J. S., Chief Engr., Marin Munic. Water Dist., San Rafael, Calif. (Jan. '27)

Peters, Wm. A., *see* Jerome Water Co.

Peterson, J. H., Johns-Manville Corp., 159 New Montgomery St., San Francisco, Calif. (Jan. '35)

Pflanz, E. L., 695 Vernon Ave., Glencoe, Ill. (July '35)

Pharaoh, Harry W., Clymer Water Service Co., Indiana, Pa. (Dec '27)

Pharr, J. M., Chemist & Bacteriologist, Newport News Waterworks Com., Denbigh, Va. (Jan. '37)

Phelps, Earle B., Prof. of San. Science, Columbia Univ., 630 W. 168th St., New York, N Y. (Oct '14)

Phelps, Edmund S., Advertising Mgr., Quigley Company, Inc., 56 W. 45th St., New York, N. Y. (Jan. '40)

Phelps, Geo. E., Partner-Engr., Duff & Phelps, 208 S. La Salle St., Chicago, Ill. (Jan. '39)

Philadelphia Suburban Water Co., Van Horn Ely, Jr., 762 Lancaster Ave., Bryn Mawr, Pa. (Corp. M May '09)

Phillips, James E., Dept. of Water & Power, Box 3669 Terminal Annex, Los Angeles, Calif. (Apr. '31)

Phillips, M. H., Supt., Paragould Water Works, Paragould, Ark. (July '38)

Phillips, R. S., Chief Chemist, Water Dept., 206 Dacian Ave., Durham, N. C. (Oct. '35)

Phillis, Howard D., Supt., Suburban Mutual Water Co., 945 N. Main St., Los Angeles, Calif. (Oct. '37)

Phipps & Bird, Inc., L. C. Bird, 915 E. Cary St., Richmond, Va. (Assoc. M. Jan. '35)

Phoenix Meter Corp., V. E. Arnold, 147 Waterbury Ave., Prince's Bay, Staten Island, N. Y. (Assoc. M. May '27)

Piatt, William M., Cons. Engr., Durham, N. C. (Aug. '21)

Picado, Ramon M., Cons. Engr., San Jose, Costa Rica (May '30)

Picard, Armand, Jr. Civ. Engr., Draftsman, Detroit Water Supply, 2940 W. Chicago Blvd., Detroit, Mich. (Affil. Jan. '39)

Pickels, George W., Univ. of Illinois, 210 Engineering Hall, Urbana, Ill. (Oct. '37)

Pile, Richard, Supt. of Water Works, Somerset, Pa. (Mar. '30)

Pincus, Sol, San. Engr., 225 W. 86th St., New York, N. Y. (Feb. '20)

Piner, Raymond E., Chemist, Springfield City Water Co., 801 Boonville Ave., Springfield, Mo. (July '35)

Pinkham, Chesley M., Chief Operator—Filter Plant, Water Works Dept., 1312 Colina Lane, Santa Barbara, Calif. (Oct. '37)

Pinkston, J. T., Supt. of Water Works, City Hall, Meridian, Miss. (Apr. '29)

Pinner, John A., Jr., Supt., Water Dept., Brookfield, Ill. (Oct. '39)

Piper, Fred V. H., Office Mgr., Bureau of Water, City Hall, Niagara Falls, N. Y. (Apr. '37)

Pirie, Jas. C., Sales Engr., 802 N. Fairview Ave., Lansing, Mich. (Apr. '38)

Pirnie, Malcolm, Cons. Engr., 25 W. 43rd St., New York, N. Y. (May '17) *Diven Medal '31. Director '31–'33, '35–'41. President '34.*

Pirnie, Malcolm, Jr., 25 West 43rd St., New York, N. Y. (Jr. M. Oct. '39)

Pitometer Co., The, 50 Church St., New York, N. Y. (Assoc. M. July '06)

Pittman, R. R., Arkansas Power & Light Co., Pine Bluffs, Ark. (Oct. '34)

Pittsburg Munic. Power Co., Frank R. Chilton, City Mgr., Pittsburg, Calif. (Corp. M. Feb. '30)

Pittsburgh-Des Moines Steel Co., J. E. O'Leary, Neville Island, Pittsburgh, Pa. (Assoc. M. Apr. '14)

Pittsburgh Equitable Meter Co., R. S. Reed, Jr., 400 N. Lexington Ave., Pittsburgh, Pa. (Assoc. M. June '98)

Plamondon, Adrien, Engr. & Contractor, 369 Mount-Royal St., W., Montreal Que., Can. (May '16)

Plumb, D. S., Co., Inc., L. A. Hall, Vice-Pres., 73 Norfolk St., Newark, N. J. (Assoc. M. June '39)

Plummer, Wade, Supt., Butte Water Co., Butte, Mont. (Dec. '25) *Director '40-'42.*

Poffenroth, Peter B., Supt., Water Dept., City Hall, Endicott, Wash. (Apr. '38)

Pohl, John A., Eng. Draftsman, Bureau of Water Works & Supply, 3817 Sheffield Ave., Los Angeles, Calif. (Apr. '38)

Pointer, William W., Supt. & Gen. Mgr., City Light, Water & Gas Dept., Troy, Ala. (Apr. '29)

Poling, C. A., Asst. Water Sales Agent, Los Angeles Dept. of Water & Power, 10411 Camarillo St., North Hollywood, Calif. (Oct. '34)

Polk, Wesley W., Comr. of Public Works, City Engr. & Supt., Water Dept., City Hall, Evanston, Ill. (Mar. '26)

Pollock, L. V., Asst. Mgr. & Civ. Engr., Citizens Water Co., 62 E. Wheeling St., Washington, Pa. (July '39)

Pollock, T. H., Supt., Plattsmouth Water Corp., 130 N. 6th St., Plattsmouth, Neb. (June '40)

Pomona Pump Co., 206 E. Commercial St., Pomona, Calif. (Assoc. M. May '27)

Poole, B. A., State San. Engr., 333 W. Hampton Drive, Indianapolis, Ind. (Jan. '35)

Poole, George J., Supt. of Pumping Stations, Water Dept., 3855 Emerson Ave., N., Minneapolis, Minn. (June '30)

Port Hope Waterworks Com., George W. Garnett, Chairman, Port Hope, Ont., Can. (Corp. M. Mar. '29)

Porter, D. P., Supt. of Water Works, 1305 E. 4th St., Pueblo, Colo. (Sept. '16) *Director '31.*

Porter, F. B., Pres., Southwestern Labs., Box 1379, Fort Worth, Tex. (June '30)

Porter, Fred S., Gen. Mgr., Water Dept., 400 Municipal Bldg., 215 W. Broadway, Long Beach, Calif. (Oct. '32)

Porter, Herman G., Sanitarian, Indiana State Board of Health, 226 W. Broadway, Princeton, Ind. (Oct. '38)

Porter, H. Hobart, *see* American Water Works & Elec. Co., Inc.

Porter, S. J., 345 Vermont St., San Francisco, Calif. (Oct. '37)

Portland Bureau of Water Works, Ralph C. Clyde, City Comr., 115 City Hall, Portland, Ore. (Corp. M. Apr. '38)

Portland Cement Assn., W. F. Tempest, Repr., Highways & Munic. Bureau, 33 W. Grand Ave., Chicago, Ill. (Corp. M. Oct. '37)

Porzelius, A. F., Mgr., City Water Co., Chattanooga, Tenn. (July '20) *Trustee '30. Director '31, '32.*

Potter, H. N., Chem. Engr., Dearborn Chemical Co., 2454-2464 Dundas St., W., Toronto, Ont., Can. (Apr. '39)

Potter, Howard H., Water Works Engr., Maine Public Utilities Com., State House, Augusta, Me. (Jan. '40)

Potter, James T., Chem. Engr., 314 Wilder Bldg., Charlotte, N. C. (Jan. '39)

Potts, Clyde, Civ. & San. Engr., 30 Church St., New York, N. Y. (July '06)

Potts, H. G., 257 Superior St., Wyandotte, Mich. (Jan. '38)

Poughkeepsie Board of Public Works, Charles O. Conger, Supt., Eastman Park, Poughkeepsie, N. Y. (Corp. M. Dec. '12)

Poulter, A. F., Local Mgr., California Water Service Co., 1235 State Highway, Menlo Park, Calif. (Jan. '37)

Powell, Alexander C., 136 Grant St., Bangor, Me. (Mar. '10)

Powell, H. P., *see* Griffin Light, Water & Sewerage Dept.

Powell, Joe C., Distr. Supt., City Hall, Union City, Tenn. (Apr. '40)

Powell, Lee H., City Mgr., Temple, Tex. (Oct. '39)

Powell, Sheppard T., Cons. Chem. Engr., 330 N. Charles St., Baltimore, Md. (July '06)

Powers, Leonard T., Supt., Water & Light Dept., East Grand Forks, Minn. (Apr. '40)

Powers, Newton W., Electrician, Filtration Plant, Detroit Water Dept., Water Works Park, Detroit, Mich. (Apr. '40)

Pracy, Geo. Wesley, Supt., San Francisco Water Dept., 425 Mason St., San Francisco, Calif. (May '15) *Trustee '28-'30. President '33. Director '34.*

Pratt, Arthur H., Cons. Engr., 24 Commerce St., Newark, N. J. (Jan. '23)

Pratt, Desmond F., *see* Minneapolis Com. on Water Works

Pratt, Gilbert H., Div. Mgr., Wallace & Tiernan Co., Inc., 350 Newberry St., Boston, Mass. (June '16)

Pratt, S. W., *see* Seneca Falls Water Dept.

Pray, John W., Supt. of Water Works, Ft. Dodge, Iowa (June '13) *Fuller Award '39.*

Presley, R. H., City San. Engr., Tyler, Tex. (Oct. '39)

Preston Light & Water Com. on Public Utilities, W. E. Swartz, Supt., 833 King St., Preston, Ont., Can. (Corp. M. Jan. '38)

Price, H. Arthur, Civ. Engr., Dept. of Water & Power, 1729 W. 20th St., Los Angeles, Calif. (Oct. '34)

Price, Norman, Gen. Foreman, Repair & Meter Service, Rochester Water Works, Dewey Ave. & Bloss St., Rochester, N. Y. (July '35)

Price, Robert E., Mech. Engr., Dept. of Water & Light, Miamisburg, Ohio (Jan. '35)

Price, Will, Supt. of Water & San. Sewers, City Hall, Longmont, Colo. (Jan. '34)

Priess, O. L., Water Works Supply Salesman, P. O. Box 5190, Denver, Colo. (July '37)

Princeton Water & Lighting Co., Philip Rector, Local Mgr., 111 W. Broadway St., Princeton, Ind. (Corp. M. Jan. '37)

Prindle, George B., Supt. of Water Works, 374 Oakland Drive, Highland Park, Ill. (Mar. '24)

Pringle, H. L., *see* Whitby Public Utility Com.

Pringle, J. T., Supt., Stamford Water Works, 981 Drummond Rd., Niagara Falls, Ont., Can. (Apr. '25)

Prior, G. W., *see* Laguna Beach Co. Water Dist.

Prior, John C., Prof. of San. Eng., Brown Hall, Ohio State Univ., Columbus, Ohio (Oct. '26)

Pritchard, John C., 5137 Waterman Ave., St. Louis, Mo. (Feb. '26)

Pritchett, David H., Supt., Munic. Light & Water Plant, Madisonville, Ky. (Apr. '38)

Proctor, Edward M., Cons. Engr., 177 Inglewood Drive, Toronto 5, Ont., Can. (May '21)

Proportioneers, Inc., Jeff. Corydon, Pres., 9 Codding St., Providence, R. I. (Assoc. M. Apr. '39)

Propst, J. M., Independence Waterworks Co., 206 N. Liberty St., Independence, Mo. (Jan. '36)

Providence Dept. of Public Works, Philip J. Holton, Jr., Public Works Office, City Hall, Providence, R. I. (Corp. M. Oct. '24)

Provost, Andrew J., Jr., Darien, Conn. (May '08)

Pruitt, A. C., Supt., Water Dept., Rule, Tex. (Oct. '39)

Public Service Co. of Indiana, G. J. Oglebay, 800 Traction Terminal Bldg., Indianapolis, Ind. (Corp. M. Feb. '10)

"Public Works," W. A. Hardenbergh, Vice-Pres., 310 E. 45th St., New York, N. Y. (Assoc. M. May '18)

Puckhaber, Fred H., Sales Engr., 1119 Liberty Bank Bldg., Dallas, Tex. (Apr. '38)

Puente, Manuel de J., Elec. Engr., Hotel Nacional, Havana, Cuba (Jan. '36)

Purcell, Hugh G., Mgr., Hugh G. Purcell Co., 304 Colman Bldg., Seattle, Wash. (Jan. '28)

Purcell, Lee T., Analyst, North Jersey Dist. Water Supply Com., Wanaque, N. J. (Jan. '31)

Purity Springs Water Co., G. B. Warner, Gen. Mgr., Box 30, Tampa, Fla. (Corp. M. July '35)

Purser, John R., Jr., Treas., J. R. Purser Sales Eng., Inc., Independence Bldg., Charlotte, N. C. (Oct. '39)

Pyle, Fred D., *see* San Diego Water Dept.

Quandt, Charles H., Quandt Pumping Station, P. O. Box 42, Torrance, Calif. (Jan. '36)

Quayle, L. A., Chief Engr., Dept. of Public Utilities, City Hall, Cleveland, Ohio (July '35)

Quigley Co., Inc., I. A. Pfeil, 56 W. 45th St., New York, N. Y. (Assoc. M. Oct. '35)

Quigley, Lewis A., Supt., City Water Works, 3320 W. Berry, Fort Worth, Tex. (June '27)

Quigley, T. T., San. Engr., Pardee Engineering Co., 2422 E. 74th St., Chicago, Ill. (Oct. '37)

Quilty, Patrick, Chief Engr., Dept. of Water Supply, Gas & Elec., 601 W. 163rd St., New York, N. Y. (May '30)

Quimby, Frank K., Const. Engr., Racine Water Dept., City Hall, Racine, Wis. (July '30)

Quincy Water Works Com., W. R. Gelston, Jr., 314 Maine St., Quincy, Ill. (Corp. M. Apr. '27)

Quinn, John J., Chemist, Knoxville Water Dept., 2915 McCalla Ave., Knoxville, Tenn. (May '30) *Director '36-'38.*

Quinnell, Fred, Comr. of Public Works, Box 684, Roundup, Mont. (Feb. '22)

Quirk, M. Edward, Asst. Supt., Water Dept., 38 Sutton St., Peabody, Mass. (Apr. '37)

Raab, Frank, Chemist & Bacteriologist, Fridley Filtration Plant, Minneapolis, Minn. (Oct. '21)

Radcliffe, John L., Chemist, Elizabethtown Water Co. Consolidated, 535 Trotter Lane, Elizabeth, N. J. (Feb. '20)

Rainey, Clarence M., Water Supt., 735 W. Bonneville St., Pocatello, Idaho (Nov. '27)

Ralls, W. E., Supt., Trenton Munic. Utilities, Trenton, Mo. (Apr. '39)

Ramacher, Bismark E., Meter Tester, Fresno City Water Dept., 1926 Tuolumne St., Fresno, Calif. (Oct. '38)

Ramey, Al., Cons. Engr., 2008 Linwood Blvd., Kansas City, Mo. (Apr. '40)

Rammer, H. L., Chief Chemist, Lab., Fibreboard Products, Inc., Stockton, Calif. (Oct. '39)

Ramseier, R. E., 1050 Curtis St., Berkeley, Calif. (Apr. '39)

Ramsey Water Works, George D. Binet, Supt., 33 N. Central Ave., Ramsey, N. J. (Corp. M. July '35)

Randall, C. C., Supt., Lincolnton Water Dept., Lincolnton, N. C. (July '37)

Randall, William Thomas, Neptune Meters, Ltd., 345 Sorauren Ave., Toronto, Ont., Can. (Jan. '38)

Randlett, Fred Morse, Vice-Pres. & Gen. Mgr., Robert W. Hunt Co., 175 W. Jackson Blvd., Chicago, Ill. (June '20) *Trustee '25-'27.*

Raney, W. B., Water Supt., Sulphur Springs, Tex. (Oct. '39)

Rankin, R. S., Mgr., The Dorr Co., Inc., 221 N. La Salle St., Chicago, Ill. (Apr. '40)

Rapp, William M., Supt., Const. & Distr., Atlanta Water Works, P. O. Box 584, Atlanta, Ga. (May '99) *Honorary M. '37.*

Rasmussen, Charles E., Asst. Mech. Engr., Dept. of Public Works, 895 Gladstone Ave., Detroit, Mich. (Affil. Jan. '39)

Ratcliffe, R. C., 227 S. Grant St., Denver, Colo. (Jan. '37)

Rathert, F. A., Supt. of Water Works, Junction City, Kan. (Oct. '28)

Ratliffe, Clyde, Plant Operator, Water Dept., Wadesboro, N. C. (Apr. '40)

Rau, William J., Supt. in Charge of Distr., Jamaica Water Supply Co., 161-20—89th Ave., Jamaica, N. Y. (Jan. '36)

Rausch, Clair C., Jr. San. Chemist, 2560 Harding Ave., Detroit, Mich. (July '38)

Rauscher, Forest L., 904 W. Greene St., Piqua, Ohio (July '35)

Rawlins, George S., Civ. Engr., 1827 Belvedere Ave., Charlotte, N. C. (Oct. '39)

Rawn, A. M., Asst. Chief Engr., Los Angeles County Sanitation Dist., 110 S. Broadway, Los Angeles, Calif. (Oct. '34)

Ray, A. J., Supt., Water Dept., McCook, Neb. (Jan. '40)

Read, A. W., Water Dept., Bangor, Me. (July '35)

Read, C. S., *see* Tuscaloosa, City of

Read, Daniel, Treas., East Bay Munic. Utility Dist., 512—16th St., Oakland, Calif. (Oct. '39)

Read, Geo., Meter & Service Supt., Dept. of Water & Power, Box 3669 Terminal Annex, Los Angeles, Calif. (Sept. '29)

Read, Miles H, Asst. Engr., Simplex Valve & Meter Co., 68th & Upland Sts., Philadelphia, Pa. (Apr. '30)

Reader, R. C., Filter Operator, Bonita, Calif. (Jan. '38)

Reading Bureau of Water, Howard McDonough, Director, 209 City Hall, Reading, Pa. (Corp. M. Mar. '16)

Reager, John J., Supt. & Engr., Perth Amboy Water Works, City Hall, Perth Amboy, N. J. (Jan. '37)

Reardon, P. H., Supt., City Water Dept., Marion, Ind. (Jan. '39)

Rebsamen, Lloyd M., Mgr., City Water & Light Plant, Jonesboro, Ark. (Jan. '34)

Recio, Jeronimo Acosta, Edificio America, Calle N 408, Vedado, Havana, Cuba (Apr. '39)

Rector, Philip, *see* Princeton Water & Lighting Co.

Red Hed Mfg. Co., 368 Congress St., Boston, Mass. (Assoc. M. Apr. '39)

Redding, Harry P., Engr., Durham Water Dept., No. 10 Glenn Apts., Durham, N. C. (Oct. '39)

Redfern, W. Blaine, James, Proctor & Redfern, 1004 Exchange Life Bldg., 36 Toronto St., Toronto 2, Ont., Can. (Nov. '19)

Redington, H. R., National Tube Co., 1719 Frick Bldg., Pittsburgh, Pa. (Apr. '40)

Reece, Howell, Webster Hotel, 2150 N. Lincoln Park W., Chicago, Ill. (Oct. '38)

Reed, Clarence H., Asst. San. Engr., Metropolitan Water Works, Framingham, Mass. (May '30)

Reed, I. H., Vice-Pres. & Treas., Sedalia Water Co., 111 W. 4th St., Sedalia, Mo. (Jan. '39)

Reed, Paul W., Asst. Engr., Bureau San. Eng., Indiana State Board of Health, 1098 W. Michigan St., Indianapolis, Ind. (Apr. '40)

Reep, E. P., Chemist, Water Works Dept., Girard, Ohio (July '35)

Rees, Rhea, Supt., Water Dept., City Hall, Sioux Falls, S. D. (Jan. '39)

Refinite Corp., The, C. W. Woods, Refinite Bldg., Omaha, Neb. (Assoc. M. Apr. '32)

Regenfuse, Paul, Chemist, South Carolina Electric & Gas Co., Parr, S. C. (Apr. '39)

Regester, Robert T., Cons. Engr., Baltimore Life Bldg., Baltimore, Md. (July '35)

Regina Water Works Dept., J. W. D. Farrell, Supt., City Hall, Regina, Sask., Can. (Corp. M. Apr. '24)

Rehler, Joseph E., *see* Olean Board of Water Comrs.

Rehmann, E. J., Resident Engr., 12th St., Hammonton, N. J. (Oct. '38)

Reichardt, H. G., Supt., City Water Dept., Watertown, Wis. (Oct. '31)

Reid, E. L., Supt., Water Dept., Cleburne, Tex. (Oct. '39)

Reid, H. N., Supt. of Water Works, Beamsville, Ont., Can. (Apr. '40)

Reid, W. M., *see* Canton Munic. Utilities

Reid, Joseph Y. L., Supt. of Filtration, Trenton Water Dept., 535 Parkway Ave., Trenton, N. J. (Oct. '38)

Reilly, Raymond T., Hydr. & San. Engr., 20 N. Wacker Drive, Chicago, Ill. (July '35)

Reilly Tar & Chemical Corp., William Higburg, 1615 Merchants Bank Bldg., Indianapolis, Ind. (Assoc. M. Jan. '36)

Reinhardt, Charles O., Asst. Engr., Illinois State Water Survey, 719 S. Foley St., Champaign, Ill. (Jan. '39)

Reinhardt, Harry, Vice-Pres., California Water & Telephone Co., 485 California St., San Francisco, Calif. (Apr. '31)

Reinhold, Richard H., Dist. Sales Mgr., Darling Valve & Mfg. Co., 216 Orchard Lane, Edgeworth, Sewickley, Pa. (Apr. '39)

Reinicker, L. T., Vice-Pres., Riverton-Palmyra Water Co., Morgan & Bank Aves., Palmyra, N. J. (June '29)

Reinke, Edward A., Sr. San. Engr., Bureau of San. Eng., State Dept. of Public Health, 3093 Life Sciences Bldg., Berkeley, Calif. (Nov. '23)

Reliable Iron Foundry, Inc., 1583 Fishburn St., Los Angeles, Calif. (Assoc. M. July '34)

Renshaw, William C., Asst. Engr., Water Dept., 425 Mason St., San Francisco, Calif. (Nov. '33)

Rensselaer Valve Co., Troy, N. Y. (Assoc. M. May '90)

Republic Steel Co., Sales Promotion Div., Republic Bldg., Cleveland, Ohio (Assoc. M. Apr. '32)

Requardt, Gustav J., Whitman, Requardt & Smith, Engrs., West Biddle St. at Charles, Baltimore, Md. (May '23)

Revelle, J. Edgar, Contracting Engr., Chicago Bridge & Iron Co., 332 S. Michigan Ave., Chicago, Ill. (Apr. '40)

Revere Copper & Brass, Inc., W. Weir Henry, Asst. Sales Mgr., 230 Park Ave., New York, N. Y. (Assoc. M. Aug. '28)

Reynolds, Abel, Treas., New England Water, Light & Power Assoc., 833 Hospital Trust Bldg., Providence, R. I. (July '29)

Reynolds, Albert H., Chief Chemist, Dearborn Labs., 1029 W. 35th St., Chicago, Ill. (Dec. '29)

Reynolds, Archie G., Mgr., Huntington Park Water Dept., City Hall, Huntington Park, Calif. (Oct. '39)

Reynolds, Frank H., 403 Volunteer Bldg., Atlanta, Ga. (July '35)

Reynolds, James H., Asst. Supt., Lowell Water Works, City Hall, Lowell, Mass. (Jan. '36)

Reynolds, Leon B., Prof. Hydr. & San. Eng., Room 271, Stanford Univ., Calif. (Nov. '28)

Reynolds, M. W., Supt., City Water Dept., Durand, Mich. (July '39)

Reynolds, Otto S., Water Works Engr., 6220 Harrison St., Kansas City, Mo. (Aug. '27)

Reynolds, R. W., *see* West Palm Beach Water Co.

Rhoads, A. L., Supt., West Virginia Water Service Co., Bluefield, W. Va. (May '26)

Rhodes, Fred, City Mgr. & Director of Public Works, San Diego, Calif. (Oct. '34)

Rhyne, C. E., Supt. of Water Works, Gastonia, N. C. (Jan. '22)

Rhynus, C. P., Box 526, Maryville, Tenn. (May '12)

Rial, Walter Percy, Engr.-in-Chief, Shanghai Water Works Co., Ltd., 484 Kiangse Rd., Shanghai, China (Jan. '39)

Rice, B. P., San. Engr., State Board of Health, Columbia, S. C. (Apr. '37)

Rice, Cyrus Wm., Pres., Cyrus Wm. Rice Co., Inc., Highland Bldg., Pittsburgh, Pa. (Oct. '24)

Rice, Homer D., Mgr., Buffalo Div., New York Fire Insurance Rating Organization, 840 Marine Trust Bldg., Buffalo, N. Y. (Apr. '37)

Rice, Hugh B., Town Mgr., Lexington, Va. (June '34)

Rice, Owen, Hall Labs., Inc., 300 Ross St., Pittsburgh, Pa. (Apr. '37)

Rice, Palmer J., Filter Plant Operator, Water Dept., 2401 Chapel Hill Rd., Durham, N. C. (Oct. '39)

Rich, Edward D., Director, Bureau of Eng., Michigan Dept. of Health, Lansing, Mich. (Jan. '39)

Rich Mfg Co., Ltd., E. F. Alt, Sales Mgr., 3851 Santa Fe Ave., Los Angeles, Calif. (Assoc. M. Sept. '27)

Richards, E. D., Mgr., Valley Water Co., P. O. Box 56, La Canada, Calif. (July '36)

Richards, H. H., Supt., Industrial Chemical Sales Div., West Virginia Pulp & Paper Co., No. 1 Chemical Plant, Piedmont, W. Va. (Jan. '37)

Richardson, Charles G., Sales Mgr., Builders Iron Foundry, Providence, R. I. (July '20)

Richardson, G. S., *see* Tilbury Public Utilities Com.

Richardson, J. C., Supt. & Chief Chemist, Saginaw Filter Plant, Saginaw, Mich. (May '30)

Richetta, J. D., Asst. Engr., State Board of Health, 201 State House Annex, Indianapolis, Ind. (Jan. '37)

Richey, Dale, Teaching Fellow, Mississippi State College, State College, Miss. (Oct. '39)

Richfield Springs Water Com. Howard Crist, Supt., Richfield Springs, N. Y. (Corp. M. Oct. '39)

Richheimer, Charles E., Cons. Engr., P. O. Box 36, Jacksonville, Fla. (Jan. '37)

Rickard, Grover E., Engr. in Charge of Filtration, City Water Works, 11 City Hall, Burlington, Vt. (June '26)

Riddell, C. C., Supt., City Water Works, Raton, N. M. (July '35)

Riddick, Thomas M., Cons. Engr. & Chemist, 369 E. 149th St., New York, N. Y. (Oct. '34)

Riddle, Mary A. L. (Mrs.), Water Chemist, Dept. of Water & Power, Box 3669 Terminal Annex, Los Angeles, Calif. (July '37)

Ridenour, Ralph O., Jr. Civ. Engr., 1039 Redondo Blvd., Los Angeles, Calif. (Apr. '38)

Ridenour, W. E., Chief Chemist, Bird Archer Co., 4337 N. American St., Philadelphia, Pa. (Dec. '28)

Ridgely, Raymond G., Vice-Pres., Pinellas Water Co., P. O. Box 2308, St. Petersburg, Fla. (Oct. '30)

Ridgway, Wm. C., Supt., Water Works, 111 E. Main St., Lebanon, Ind. (Jan. '40)

Riedel, Carl Martin, Designing Engr., 8020 Paxton Ave., Chicago, Ill. (June '33)

Riehl, Merrill L., Instructor, Case School of Applied Science, University Circle, Cleveland, Ohio (Apr. '40)

Riker, I. Russell, Engr., Boro Hall, Princeton, N. J. (Affil. Jan. '38)

Riley, E., *see* Home Water Dist.

Rimbach, T. N., Sales Engr., The Permutit Co., 220 Ottawa St., Lincoln, Ill. (Apr. '40)

Rimmer, James H., Asst. Supervisor, Cincinnati Water Works, City Hall, Cincinnati, Ohio (Apr. '40)

Riordan, John E., Supt. of Filtration, 14 Sunset Hill Ave., Norwalk, Conn. (Oct. '37)

Ripple, Oliver J., Supt. of Filtration, R. F. D. No. 2, Littleton, Colo. (Jan. '30) *Director '41-'43.*

Ritch, Paul E., Asst. Civ. Engr., Los Angeles Dept. of Water & Power, Independence, Calif. (Oct. '34)

Ritchie, E. G., 5, Lynedoch Ave., E. St. Kilda, S. 2, Melbourne, Australia (Sept. '12)

Ritchie, Hugh C., City Engr., Yorktown, Sask., Can. (Jan. '37)

Ritzel, William J., Supt., Pasadena Water Dept., 1040 Manzanita St., Pasadena, Calif. (Oct. '38)

Riverside Water Dept., R. L. Boulden, Riverside, Calif. (Corp. M. July '26)

Roach, Robert, *see* Muscatine City Water Works

Robbins, Everitt, Supt., Dept. of Water Works, 55 N. First St., Scottsburg, Ind. (July '37)

Robbins, Franklin H., Designing Engr., Board of Water Supply, 346 Broadway, New York, N. Y. (Apr. '30)

Robbins, George M., Sales Agent, U. S. Pipe & Foundry Co., 625 Plymouth Bldg., Minneapolis, Minn. (Oct. '39)

Robbins, James Melvin, Assoc. Prof. in Civ. Eng., Newark College of Eng., 367 High St., Newark, N. J. (Jan. '39)

Robbins, W. D., City Mgr., City Hall, Niagara Falls, N. Y. (Feb. '26)

Roberts, A. J., *see* Helena, City of

Roberts, Alfred M., Pres., Wanakah Water Co., R. D. No. 3, Hamburg, N. Y. (July '25)

Roberts, E. Fred, E. F. Roberts & Co., Brantford, Ont., Can. (Jan. '38)

Roberts, F. C., Jr., State San. Engr., State Board of Health, Phoenix, Ariz. (July '35)

Roberts Filter Mfg. Co., Charles F. Thomas, Darby, Philadelphia, Pa. (Assoc. M. Mar. '10)

Roberts, H. G., Dist. Mgr., Rensselaer Valve Co., 411 Sharon Bldg., San Francisco, Calif. (Oct. '37)

Roberts, James Moran, City Engr., P. O. Box 185, Dublin, Ga. (Apr. '38)

Roberts, John S., Jr., Borough Engr., Bristol, Pa. (June '20)

Roberts, William H., Comr. of Public Works, 54 Court St., Rochester, N. Y. (Apr. '38)

Robinson, Delbert W., Water Works Engr., Community Public Service Co., Fort Worth, Tex. (Apr. '27)

Robinson, Hamilton E., City Engr., City Hall, Huntington Park, Calif. (Jan. '36)

Robinson, J. Albert M., Cons. Engr., 228 N. La Salle St., Chicago, Ill. (Oct. '31)

Robinson, J. W., Gen. Mgr., County Water Dist., 216 N. Church St., Pico, Calif. (Apr. '36)

Robinson, John H., Supt., Concord Water & Sewer Dept., Town House, Concord, Mass. (Jan. '40)

Robinson, Sam P., Chief Chemist, Brunswick Pulp & Paper Co., Brunswick, Ga. (Jan. '40)

Robinson, T. C., Supt., Light & Water Dept., Granite Falls, N. C. (July '38)

Robinson, Wm. E., Water Works Engr., City Hall, Calgary, Alberta, Can. (Feb. '30)

Rocca, Agostino, S. A. Stabilimenti di Dalmine, Dalmine, Bergamo, Italy (Sept. '31)

Rock, Harold F., Dist. San. Engr., New York State Dept. of Health, 16 Dietz St., Oneonta, N. Y. (Jan. '40)

Rockfellow, D. E., Chief Draftsman, Bureau of Water Works & Supply, Box 3669 Terminal Annex, Los Angeles, Calif. (Oct. '29)

Rockwell, Willard F., Cons. Engr., 400 N. Lexington Ave., Pittsburgh, Pa. (Feb. '28)

Rod, Mons, City Water Supt., Kent, Wash. (Apr. '36)

Rodan, John T., 61 S. 27th St., Camden, N. J. (Affil. Jan. '39)

Rodriguez-Vicentini, Cesar, San. Engr., Ministerio de Obras Publicas, Avenida Sur 81, Caracas, Venezuela, S. A. (Jan. '39)

Roe, Frank C., San. Engr., The Carborundum Co., Niagara Falls, N. Y. (Jan. '35)

Roff, Amos H., Comr. of Public Works, 11 Lincoln St., Santa Cruz, Calif. (Oct. '39)

Rogers, A. H., *see* Garden City, Inc., Village of

Rogers, Lee, Pres., Layne-Western Co. of Minnesota, 3140-48 Snelling Ave., Minneapolis, Minn. (Jan. '39)

Rogers, M. W., Engr., Public Utility Com., Box 387, Carleton Place, Ont., Can. (Mar. '27)

Rogers, T. M., Easley, S. C. (July '35)

Rohan, George J., Supt., Water Works, Municipal Bldg., Waco, Tex. (Jan. '35) *Director '40-'42.*

Rohm, Noah, Service Engr., The Barrett Co., 365A E. 58th St., Maywood, Calif. (Jan. '40)

Roig, J. M. Valdes, Ave. De Belgica No. 258, Havana, Cuba (Apr. '39)

Rome Bureau of Water, C. E. Rosenburgh, City Hall, Rome, N. Y. (Corp. M. Apr. '22)

Rome, Robert, Asst. City Engr., 5891 Alma Rd., Vancouver, B. C., Can. (Dec. '30)

Romig, F. V., Mgr., Beall Pipe & Tank Corp., 1945 N. Columbia Blvd., Portland, Ore. (Jan. '35)

Roos, Charles M., Mgr., East St. Louis & Interurban Water Co., East St. Louis, Ill. (May '13) *Fuller Award '38.*

Roper, Roswell M., Engr. & Gen. Mgr., Board of Water Comrs., East Orange, N. J. (May '19)

Rosen, Milton, Comr. of Public Works, Board of Water Comrs., City Hall, St. Paul, Minn. (Oct. '38)

Rosenburgh, C. E., *see* Rome Bureau of Water

Rosenthal, Helman, Director, Dallas Labs., 2411 S. Harwood St., Dallas, Tex. (June '18)

Ross, A. W., Vice-Pres., Layne New York Co., 246 Upper Mountain Ave., Upper Montclair, N. J. (Jan. '36)

Ross Valve Mfg. Co., Inc., William F. End, Oakwood Ave., Troy, N. Y. (Assoc. M. Apr. '91)

Ross, W. H., Dist. Supt., Southern California Water Co., 214 E. Colden Ave., Los Angeles, Calif. (Jan. '40)

Rostenbach, Royal E., San. Chem. Engr., Clarke, Stewart & Wood Co., 640 W. 2nd St., Lexington, Ky. (Jan. '40)

Rothchild, H. A., Research Library, Kimberly Clark Corp., Kimberly, Wis. (Jan. '39)

Rothman, Edwin, Wallace & Tiernan Co., Inc., R.F.D. No. 4, Box 259, Bridgeport, Conn. (July '35)

Routledge, George Graham, Supt., Water Distr. Section, 332 St. Clair Ave., E., Toronto, Ont., Can. (Mar. '19)

Roux, Maurice G., Vice-Pres., Bonna Pipe Co., 40—13th St., Brooklyn, N. Y. (May '33)

Rowe, E. J., Supt., Water & Light Dept., Wellsville, N. Y. (June '21)

Rowley, Everett C., Asst. Engr., Long Island Water Corp., 337 Merrick Rd., Lynbrook, L. I., N. Y. (Feb. '34)

Rowley, R. W., Technical Sales Repr., Cliffs Dow Chemical Co., Marquette, Mich. (July '37)

Royer, R. Stuart, Cons. Engr., 207 Exchange Bldg., Richmond, Va. (Oct. '37)

Rubbo, Jacob F., Operator, Filter Plant, City Water Dept., 506—6th St., Iron Mountain, Mich. (July '38)

Rubio Canon Land & Water Assn., J. H. Scranton, Gen. Mgr., 575 Sacramento St., Altadena, Calif. (Corp. M. Oct. '30)

Rucker, A. J., Supt., City Water Dept., Gleason, Tenn. (Apr. '39)

Ruckman, Chas. L., Asst. Supt., Meter & Service Div., Dept. of Water & Power, Box 3669 Terminal Annex, Los Angeles, Calif. (Dec. '32)

Rudd, E. Irvine, Chief Engr., Public Utilities Com., State Office Bldg., Hartford, Conn. (Jan. '38)

Rudd, W. C., Engr., Water System-Const., Dept. of Water Supply, 706 Water Board Bldg., Detroit, Mich. (June '23)

Rudolfs, Willem, New Jersey Agricultural Experiment Station, Short Course Bldg., New Brunswick, N. J. (Oct. '35)

Rudser, Marguerite S., (Mrs.), Lab. Asst., Dept. of Water & Power, Box 3669 Terminal Annex, Los Angeles, Calif. (Oct. '35)

Ruehl, Edward H., 902 Travelers Bldg., Richmond, Va. (July '35)

Ruff, Harold T., Development Chem. Engr., Mead Corp., Chillicothe, Ohio (Jan. '39)

Ruge, J. H., Asst. Engr., Florida State Board of Health, Route 6, Box 29R, Jacksonville, Fla. (Jan. '39)

Ruley, M. F., Fieldman, National Aluminate Corp. of Chicago, 1248 Albion St., Denver, Colo. (Apr. '39)

Rumberger, C. A., Supt., Citizens Water Service Co., 207 Spruce St., Philipsburg, Pa. (Sept. '31)

Runels, Ralph E., Supt., Lowell Water Works, City Hall, Lowell, Mass. (Jan. '36)

Runyon, Frederick O., Cons. Engr., Runyon & Carey, 33 Fulton St., Newark, N. J. (Apr. '36)

Rupard, Homer, Prin. Asst. Engr., Indianapolis Water Co., 113 Monument Circle, Indianapolis, Ind. (Apr. '30)

Rupp, Daniel H., Water Dept., City Hall, Topeka, Kan. (Oct. '22)

Russell, Alexander, 204 Triangle Bldg., Rochester, N. Y. (Sept. '27)

Russell, D. A., Chief Chemist, Youngstown Sheet & Tube Co., Youngstown, Ohio (May '24)

Russell, J. A., Mgr., Dauphin Consolidated Water Supply Co., 15 N. 32nd St., Philadelphia, Pa. (July '35)

Russell, J. P., Editor, *Engineering & Contract Record*, 347 Adelaide St., W., Toronto 2, Ont., Can. (Jan. '34)

Russell, M. J., Draftsman, Bureau of Water Works & Supply, Box 3669 Terminal Annex, Los Angeles, Calif. (Apr. '36)

Russell, Norman F. S., Pres., U. S. Pipe & Foundry Co., Drawer 306, Burlington, N. J. (Dec. '15)

Russell, William J., Supt. of Water Dept., Benton Harbor, Mich. (Jan. '38)

Ruston, G. H., Supt. of Water, Kenilworth Water Dept., Kenilworth, Ill. (Apr. '40)

Ryan, Gerald D., 1017 Gregg St., Columbia, S. C. (July '35)

Ryle, John, Supt., Passaic Dist., Passaic Valley Water Com., 145 Prospect St., Passaic, N. J. (Dec. '19)

Rynders, Arthur, Mech. Engr., City Engr's Office, City Hall, Milwaukee, Wis. (July '37)

Sacramento Div. of Water, R. E. Mittelstaedt, Supt., Sacramento, Calif. (Corp. M. Apr. '32)

Safford, Arthur T., Engr., Proprietors Locks & Canals, 66 Broadway, Lowell, Mass. (Feb. '21)

Sage, Howard D., Comr. of Public Works, 192 S. Main St., Mechanicville, N. Y. (Apr. '39)

Sahnd, William, Water Works Supervisor, Water Works Dept., Room 140 1-2, City Hall, Cincinnati, Ohio (Oct. '38)

Saindon, Homer C., Radnor Water Dist., 2229 Nolensville Rd., Nashville, Tenn. (July '35)

Saine, L. P., Repr., Central Foundry Co., 4511 French Ave., Jacksonville, Fla. (July '38)

St. John, L. D., Chief Engr., Water Plant, Water Dept., 1st & Main Sts., Jacksonville, Fla. (Apr. '30)

St. Marys Public Utilities Com., Wm. McKee, St. Marys, Ont., Can. (Corp. M. Nov. '19)

St. Paul Board of Water Comrs., Wm. A. Parranto, Comr. of Public Utilities, St. Paul, Minn. (Corp. M. Apr. '29)

St. Thomas Public Utilities Com., J. W. Peart, Gen. Mgr., 474 Talbot St., St. Thomas, Ont., Can. (Corp. M. Apr. '09)

Salem Water Dept., William F. Ayars, Supt., Municipal Bldg., Salem, N. J. (Corp. M. Apr. '39)

Salem Water Com., C. E. Guenther, Mgr., P. O. Box 190, Salem, Ore. (Corp. M. Jan. '40)

Salina Water Dept., H. L. Brown, Supt., Salina, Kan. (Corp. M. Feb. '27)

Salomon, L. A., & Bro., Herman Salomon, 216 Pearl St., New York, N. Y. (Assoc. M. Oct. '34)

Salt Lake City Corp. Water Dept., H. K. Burton, Supt., Salt Lake City, Utah (Corp. M. Feb. '20)

Salter, FitzGerald, Supt., City Water Works, Montgomery, Ala. (July '38)

Sampaio, Geraldo Ferreira, San. Engr., Caixa Postal 1631, Rio de Janeiro, Brazil, S. A. (May '30)

Samuel, T. D., Jr., Chief Engr., & Supt., Water Dept., City Hall, Kansas City, Mo. (Oct. '28)

San Antonio, City Water Board of, W. D. Masterson, Mgr., San Antonio, Tex. (Corp. M. Oct. '38)

San Bernardino Board of Water Comrs., Bard Livingstone, Supt., 416 Third St., San Bernardino, Calif. (Corp. M. Nov. '33)

San Diego Water Dept., Fred D. Pyle, Hydr. Engr., Civic Center, San Diego, Calif. (Corp. M. Jan. '25)

San Fernando Water Dept., Harry E. Waite, Supt., City Hall, San Fernando, Calif. (Corp. M. Jan. '36)

San Francisco Water Dept., N. A. Eckart, Gen. Mgr. & Chief Engr., 425 Mason St., San Francisco, Calif. (Corp. M. Nov. '33)

San Jose Water Works, Ralph Elsman, Pres., 374 W. Santa Clara St., San Jose, Calif. (Corp. M. Apr. '13)

Sanborn, James F., Cons. Engr., 30 Church St., New York, N. Y. (Aug. '21)

Sanchis, Joseph M., % American Consulate, Carácas, Venezuela, S. A. (Oct. '34)

Sandbach, Harold, Supt., Water Dept., Gary Heat, Light & Water Co., 5th & Broadway, Gary, Ind. (July '35)

Sanders, John F., Plant Operator, Boonville Water Dept., Boonville, Mo. (Jr. M. Jan. '40)

Sanders, Perry, Supt., Water Dept., Duncan, Okla. (Oct. '39)

Sanders, W. H., Operator, Water Works, Prosper, Tex. (Oct. '39)

Sanderson, A. U., Chief Engr. of Water Supply, Dept. of Works, City Hall, Toronto, Ont., Can. (June '20) *Director '32-'34.*

Sandquist, Emil, 1159 W. Gold St., Butte, Mont. (Jan. '27) *Director '34-'36.*

Sandy, C. R., Supt., Munic. Water Works, Sistersville, W. Va. (Affil. Jan. '39)

Sangdahl, Geo. S., Mgr., Cleveland Office, Chicago Bridge & Iron Works, 654 Rockefeller Bldg., Cleveland, Ohio (Apr. '36)

Santa Ana Valley Irrigation Co., L. E. Blakeley, Chief Engr., 154 N. Glassell St., Orange, Calif. (Corp. M. Apr. '38)

Santa Ana Water Dept., Jos. P. Smith, Water Com., City Hall, Santa Ana, Calif. (Corp. M. Oct. '37)

Santa Barbara, City of, D. D. Smith, Supt., Water Dept., City Hall, Santa Barbara, Calif. (Corp. M. Oct. '37)

Santa Monica, City of, W. W. Milliken, Comr. of Public Works, City Hall, Santa Monica, Calif. (Corp. M. June '26)

Santana, Rogelio A., Civ. Engr. & Chemist, J. Bruno Zayas 114, Vibora, Havana, Cuba (Jan. '39)

Sargent, George Henry, City Engr., La Grange, Ga. (Dec. '29)

Saunders, Daniel J., Mgr. of Ind. Sales, The Permutit Co., 330 W. 42nd St., New York, N. Y. (Apr. '37)

Saunders, William K., Co-Partner, Couse & Saunders, 12740 Lyndon Ave., Detroit, Mich. (May '30)

Saville, Caleb Mills, Mgr. & Chief Engr., Water Works, 53 N. Beacon St., Hartford, Conn. (Mar. '16)

Saville, Clement, *see* Kapuskasing, Corp. of Town of

Saville, Thorndike, Prof. of Hydr. & San. Eng., New York Univ., Box 65, University Heights, New York, N. Y. (Aug. '20)

Sawyer, Robert W., Asst. Engr. with Malcolm Pirnie, 25 W. 43rd St., New York, N. Y. (Oct. '32)

Scarborough Public Utilities Com., Ronald Harrison, Mgr. & Secy.-Treas., 1666 Kingston Rd., Toronto 13, Ont., Can. (Corp. M. Jan. '35)

Scarritt, Elwood W., Chief Chemist, Elgin Softener Corp., 57 North St., Elgin, Ill. (Dec. '28)

Schaefer, F. Albert, 711 E. Market St., New Albany, Ind. (July '35)

Schaefer, Walter A., San. Engr., 38 Prince St., Elizabeth, N. J. (Jan. '37)

Schaeffer, Joseph G., San. Engr., Dept. of Public Health, Parliament Bldgs., Regina, Sask., Can. (Jan. '37)

Schanze, C. E., Mgr., Joplin Water Works Co., Joplin, Mo. (Oct. '38)

Scharff, Maurice R., Cons. Engr., 285 Madison Ave., New York, N. Y. (Jan. '26)

Schaut, George G., Chief Chemist, Bureau of Water, Belmont Ave. & Ford Rd., Philadelphia, Pa. (Oct. '22)

Scheinert, Albert G., Sales Mgr., Pittsburgh Branch, Rensselaer Valve Co., 2203 Oliver Bldg., Pittsburgh, Pa. (Oct. '39)

Schenectady, City of, John H. Burwell, Engr., Div. of Water, 102 City Hall, Schenectady, N. Y. (Corp. M. July '37)

Schiverea, W. J., Borough Engr., Municipal Bldg., Freehold, N. J. (Oct. '35)

Schlicht, John C., Supt. of Const. & Serv., Hackensack Water Co., 624 Park Ave., Weehawken, N. J. (June '26)

Schlott, Ralph, Supervisor of Distr., Canton Water Works, 1400—25th St., N.W., Canton, Ohio (July '39)

Schmid, Theophilus, Jr., Asst. San. Engr., Water Purif. Div., 10404 Sangamon St., Chicago, Ill. (Apr. '26)

Schmidt, Arthur L., Chief Engr., Div. of Water, 1584 Norman Ave., Youngstown, Ohio (Apr. '40)

Schmidt, Howard D., San. Engr., State Dept. of Health, Nashville, Tenn. (Apr. '36)

Schmit, Jos. M., City Engr. & Water Works Supt., P. O. Box 931, Lewistown, Mont. (Apr. '26) *Director '37–'39.*

Schmitt, Edwin A., Prin. Engr., U. S. Engineer Office, Room 1068, Navy Bldg., Washington, D. C. (Jan. '39)

Schmitt, Herbert C., Const. Engr., Water Dept., 3255 N. 49th St., Milwaukee, Wis. (July '38)

Schnabel, Wm. R., *see* Allentown Bureau of Water

Schneider, Alfred, Box 495, Elkader, Iowa (July '35)

Schneider, H. J., Supt. of Filtration, 1746 Doty St., Oshkosh, Wis. (June '31)

Schneider, William H., Chemist in Charge, Filtration Plant, Fremont, Ohio (Oct. '30)

Schoch, E. P., Prof. of Chemistry, Univ. of Texas, Austin, Tex. (Jan. '35)

Schoeninger, Carl J., Assoc. Elec. Engr., Dept. of Water Supply, 808 Water Board Bldg., Detroit, Mich. (Oct. '39)

Schoepfle, O. F., Chemist, Filtration Plant, 908 Vine St., Sandusky, Ohio (May '30)

Scholl, Charles E., Supt., Newcastle Water & Light Plant, 408 N. 16th St., Newcastle, Ind. (Apr. '29)

Schoolcraft, Dan, Water Works Engr., Muscatatuck Colony, Butlerville, Ind. (Affil. Apr. '38)

Schoonmaker, George N., City Mgr., Water Dept., Toledo, Ohio (Aug. '21)

Schouten, Ernest W., Dist. Mgr., Wallace & Tiernan Co., Inc., 828 Braniff Bldg., Oklahoma City, Okla. (Jan. '39)

Schroeder, E. C., Mgr., Water Works Plant, 617 N. 10th St., Manitowoc, Wis. (Aug. '24)

Schuck, H. W., Supt. of Water Dept., 804 Bayswater Ave., Burlingame, Calif. (June '27)

Schumpert, Homer W., Supt., Water, Light & Sewer Depts., P. O. Box 333, Newberry, S. C. (Aug. '25)

Schunke, G. B., Utility Acct. & Asst. Supt., 323 County City Bldg., Seattle, Wash. (Jan. '29)

Schwabe, Walter P., Connecticut Light & Power Co., Thompsonville, Conn. (Nov. '14)

Schwada, J. P., City Engr., Milwaukee, Wis. (May '24)

Schwartz, Jacob, Attorney at Law, 24 Commerce St., Newark, N. J. (Jan. '36)

Schwartz, M. C., Research Assoc., Water Technology, Eng. Experiment Station, Louisiana State Univ., University, La. (Apr. '38)

Schwartz, M. H., Supt. & Gen. Mgr., Vincennes Water Dept., Box 28, Vincennes, Ind. (June '29)

Schwartz, William J., Controller, Hackensack Water Co., 624 Park Ave., Weehawken, N. J. (Aug. '32)

Schwarz, Eugene, Supt., City Water Dept., Rochester, Minn. (June '27)

Schwier, Elmer C., Auditor, Indianapolis Water Co., 113 Monument Circle, Indianapolis, Ind. (Dec. '24)

Schwier, Harry, Mgr., Batesville Water Works, Batesville, Ind. (July '35)

Scorso, William T., Supt., Florham Park Water Dept., Hanover Rd., Florham Park, N. J. (July '39)

Scott, Guy R., San. Engr., 107 Village, Sheffield, Ala. (Oct. '37)

Scott, L. H., Filtration Engr., Water Dept., 3415 W. 22nd St., Oklahoma City, Okla. (Jan. '36) *Fuller Award '40.*

Scott, Oswald H., *see* Belleville Public Utilities Com.

Scott, R. D., Chief Chemist, Ohio Dept. of Health, 1650 Essex Rd., Columbus, Ohio (Oct. '38)

Scott, Rossiter S., Cons. Engr., 112 Park Ave., New York, N. Y. (Mar. '22)

Scott, Walter M., San. Engr., 145 S. 3rd Ave., Mount Vernon, N. Y. (Apr. '38)

Scott, Walter Moffat, Chairman of Comrs., Greater Winnipeg Water Dist., 185 King St., Winnipeg, Man., Can. (Mar. '14)

Scott, Warren J., Director, Bureau of San. Eng., State Dept. of Health, Hartford, Conn. (Oct. '22)

Scoular, Spencer Gray, City Engr., Dunedin City Corp. of New Zealand, Town Hall, Dunedin, C. I., New Zealand. (Jan. '39)

Scoville, C. M., Secy., Corona City Water Co., 707 Main St., Corona, Calif. (Jan. '35)

Scranton, J. H., *see* Rubio Canon Land & Water Assn.

Scranton-Spring Brook Water Service Co., Newton B. Lyle, 135 Jefferson Ave., Scranton, Pa. (Corp. M. June '12)

Seabury, George T., Secy., American Soc. of Civ. Engrs., 33 W. 39th St., New York, N. Y. (June '30)

Seaforth Public Utilities Com., Waterworks Dept., Seaforth, Ont., Can. (Corp. M. Jan. '39)

Seaman, Henry, Champion Paper & Fibre Co., Canton, N. C. (July '35)

Seaman, M., *see* Greeley, City of

Seattle Water Dept., W. C. Morse, Supt., County City Bldg., Seattle, Wash. (Corp. M. July '28)

Seay, J. I., Pres., Layne Central Co., Memphis, Tenn. (July '38)

Seeholzer, Bert, Jr., Hydraulic Development Corp., 50 Church St., New York, N. Y. (July '35)

Seemann, Carl W., Gen. Foreman, Water Service Dept., 3111 Newton Ave., N., Minneapolis, Minn. (Jan. '39)

Seery, Francis J., Prof. of Hydr. Eng., Cornell Univ., 504 University Ave., Ithaca, N. Y. (Nov. '19)

Segerstrom, Eric J., Riverbank Water Co., Sonora, Calif. (July '37)

Seibert, U. J., Chemist, Filter Plant, 218—22nd Ave., N., St. Cloud, Minn. (Oct. '31)

Seifert, William P., Cons. Engr., Nicholas S. Hill Assoc., 112 E. 19th St., New York, N. Y. (Jan. '36)

Self, Joseph B., Sr., Chief Engr., Muncie Water Works, R. F. D. A5, Box 28, Muncie, Ind. (Jan. '38)

Seligman, Felix, Mgr., Water & Light Dept., 414 W. First St., Duluth, Minn. (June '24) *Director '40-'42.*

Semmes, Oliver J., Jr., City Engr., Pensacola, Fla. (Apr. '37)

Seneca Falls Water Dept., S. W. Pratt, Supt., 136 Fall St., Seneca Falls, N. Y. (Corp. M. Apr. '37)

Senges, Donald C., Engr., The Permutit Co., 3521 Urbandale Ave., Des Moines, Iowa (Jan. '40)

Senior, Samuel Palmer, Pres. & Engr., Bridgeport Hydraulic Co., Bridgeport, Conn. (July '06)

Sensabaugh, Reeve Lee, Supt. of Water Supply, City Hall, Muskegon, Mich. (Jan. '39)

Sette, Francis J., 4701 Connecticut Ave., N. W., Apt. 507, Washington, D. C. (July '34)

Settle, J. E., Cons. Hydr. & San. Engr., 806 Kanawha Banking & Trust Bldg., Charleston, W. Va. (Jan. '36)

Setzler, G. V., Supt. Water & Sewers, P. O. Box 213, Saluda, S. C. (Affil. Jan. '38)

Seufer, Paul E., Asst. Public Health Engr., State Dept. of Health, Smith Tower, Seattle, Wash. (Apr. '37)

Sewickley Comrs. of Water Works, J. S. Besterman, Supt., Municipal Bldg., Sewickley, Pa. (Corp. M. July '35)

Shaneman, Fred C., Vice-Pres., Pennsylvania Salt Mfg. Co. of Wash., P. O. Box 1215, Tacoma, Wash (Jan. '28)

Shank, John J., Chemist & Bacteriologist, Wayne Labs., 17 E. Main St., Waynesboro, Pa. (May '30)

Shank, S. J., Supt. Water Dept., Escanaba, Mich. (July '38)

Shanley, A. A., Mgr., Crane Co., P. O. Box 751, Great Falls, Mont. (Apr. '38)

Shapiro, Robert, Bacteriologist, 30-07—88th St., Jackson Heights, L. I., N. Y. (July '35)

Sharon, John J., San Francisco Water Dept., 380 Urbano Drive, San Francisco, Calif. (Feb. '20)

Shaw, Arthur L., Cons. Engr., Metcalf & Eddy, 1300 Statler Bldg., Boston, Mass. (May '31)

Shaw Frank R., San. Engr., U. S. Public Health Service, U. S. Court House, Chicago, Ill. (June '28)

Shaw, Harry B., Deputy Chief Engr., Washington Suburban San. Dist., Hyattsville, Md. (Apr. '23)

Shaw, Percy A., Engr. & Supt. of Water Works, Old Court House, Manchester, N. H. (June '34)

Shaw, Walter A., Cons. Engr., 30 N. La Salle St., Chicago, Ill. (July '06)

Shawver, G. B., Supt., Plant Const. & Operation, Tennessee Electric Power Co., Chattanooga, Tenn. (Apr. '30)

Shea, John J., Supt. of Public Works, Frankfort, N. Y. (Apr. '38)

Sheboygan Board of Water Comrs., J. Allan Hammes, Office Mgr., Sheboygan, Wis. (Corp. M. June '20)

Shed, Joseph L., 505 Gerard St., East Aurora, N. Y. (Apr. '37)

Sheen, Robert T., Technical Director, 6509 N. 9th St., Philadelphia, Pa. (Jan. '38)

Sheldon, Horace A., Comr., Port Jervis, N. Y. (Apr. '31)

Shelt Co., The, H. W. Sheets, Secy., 739 Baldwin St., Elmira, N. Y. (Assoc. M. Apr. '37)

Shenango Valley Water Co., A. R. Girdwood, Box 542, Sharon, Pa. (Corp. M. Apr. '22)

Sheninger, William A., Supt. Water Dept., Corner N & E Blvds., Alpha, N. J. (Apr. '38)

Shenker, Samuel, 794½ Seymour Ave., Columbus, Ohio (July '35)

Shepard, George, City Engr., St Paul, Minn. (Apr. '33)

Sherbondy, F. G., Vice-Pres., Biggs Boiler Works Co., 1007 Bank St., Akron, Ohio (Jan. '39)

Sherman, Arthur L., 921 Bergen Ave., Jersey City, N. J. (Feb. '24)

Sherman Machine & Iron Works, E. W. Sherman, Vice-Pres., 2 26 E. Main St., Oklahoma City, Okla. (Assoc. M. Jan. '40)

Sherrill-Kenwood Water Com., Stephen R. Leonard, Chairman, Kenwood, Oneida, N. Y. (Corp. M. Apr. '21)

Sherwood, Herbert P., Sales Engr., The Permutit Co., 407 S. Dearborn St., Chicago, Ill. (Apr. '38)

Shipley, Fred G., Asst. Engr., Water Dept., Burbank, Calif. (Oct. '39)

Shnidman, Louis, Lab. Director, Rochester Gas & Elec. Corp., 89 East Ave., Rochester, N. Y. (Mar. '29)

Shockley, H. R., Mgr., Water Dept., Gladewater, Tex. (Oct. '39)

Shoemaker, Milton J., Chem. Engr., Research Products Corp., 1015 E. Washington Ave., Madison, Wis. (May '33)

Shoemaker, William C., Mgr., Richmond Water Works Corp., Richmond, Ind. (Apr. '30)

Shonerd, R. E., Chief Mech. Engr., 1006 Hall of Records, Los Angeles, Calif. (June '28)

Shore, John, Jr., Mech. Supt., Beacon Mfg. Co., P. O. Box 22, Swannanoa, N. C. (Oct. '39)

Showell, E. B., Jr., E. I. Du Pont de Nemours & Co., Station B, Buffalo, N. Y. (Nov. '25)

Shreve, G. F., *see* Oshawa Public Utilities Com.

Shuff, Evans L., Engr. & Sales Agency, 412 Title Bldg., Atlanta, Ga. (Apr. '38)

Shuldener, Henry L., 423 W. 126th St., New York, N. Y. (May '30)

Shull, Albert B., Water Treatment Plant Operator, Dept. of Water & Power, 2488 Coolidge Ave., West Los Angeles, Calif. (Apr. '33)

Shull, Kenneth Edgar, Chemist, Philadelphia Suburban Water Co., 762 Lancaster Ave., Bryn Mawr, Pa. (Jr. M. Jan. '38)

Shultz, H. M., Supt., City Water Works, City Bldg., Huntington, Ind. (Jan. '40)

Shurley, M. I., Supt., Water Dept., 210 S. Bullet, Holdenville, Okla. (Oct. '39)

Siegmund, Rudolph A., Jr., Filter Plant Operator, Tonawanda Water Works, Clay St., Tonawanda, N. Y. (Apr. '39)

Sieker, Fred W., Supt. of Water Dept., 501 E. Rutledge, Yates Center, Kan. (Oct. '39)

Sierra Pacific Power Co., Geo. A. Campbell, Pres., Reno, Nev. (Corp. M. Feb. '13)

Signor, C. V., Water Supt., Grants Pass, Ore. (Apr. '36)

Sigworth, E. A., Chemist & Technician, Industrial Chemical Sales, West Virginia Pulp & Paper Co., 230 Park Ave., New York, N. Y. (Jan. '37)

Silver Creek Water Works, J. K. Brotz, Asst. Foreman, Silver Creek, N. Y. (Corp. M. Apr. '37)

Silver, Ralph R., Business Mgr. of Journal, Southeastern Section A. W. W. A., 310 Protective Life Bldg., Birmingham, Ala. (July '35)

Simantel, Alvin, 4374 Woodland Ave., Western Springs, Ill. (July '35)

Simcoe Public Utilities Com., W. D. Stalker, Secy.-Treas., Water Works Dept., Simcoe, Ont., Can. (Corp. M. Apr. '29)

Simmonds, M. A., Resident Analyst, Brisbane City Council, Mt. Crosby, via Ipswich, Queensland, Australia (July '37)

Simmons, Frank, Supt., Water Works, Russellville, Ky. (Apr. '38)

Simmons, Paul D., Chemist, Weirton Improvement Co., Weirton, W. Va. (Oct. '38)

Simms, R. B., Supt., Water Works, Spartanburg, S. C. (May '22)

Simplex Valve & Meter Co., Everett M. Jones, Sales Mgr., 6759 Upland St., Philadelphia, Pa. (Assoc. M. May '14)

Sinclair, Harold, Turbine Equipment Co., 75 West St., New York, N. Y. (Apr. '30)

Sioux Falls Water Works, Jos. S. Nelson, Comr., Sioux Falls, S. D. (Corp. M. May '27)

Skaggs, John D., Plant Supt., Ansted Water Co., Ansted, W. Va. (July '39)

Skillman, Harold R., *see* Warrenton Water Co.

Skinker, Thomas J., 6251 San Bonita Ave., St. Louis, Mo. (July '24) *Director '31–'32.*

Skinner, Alfred E., 1112 Dolores Drive, Altadena, Calif. (Mar. '21)

Skinner, Hervey J., Pres., Skinner & Sherman, Inc., 246 Stuart St., Boston, Mass. (Apr. '26)

Skinner, John F., 1610 Idlewood Rd., Glendale, Calif. (May '27)

Slater, E. O., Smith-Emery Co., 920 Santee St., Los Angeles, Calif. (Apr. '22)

Slater, L. N., Vice-Pres., Western Pipe & Steel Co., 5717 Santa Fe Ave., Los Angeles, Calif. (Sept. '31)

Sledge, L. C., Engr., South-Eastern Underwriters Assn., Atlanta, Ga. (Jan. '37)

Slee, R. W., Mgr., Sterling Pump Co., 228 N. La Salle St., Chicago, Ill. (Jan. '38)

Sleeper, Benjamin A., Civ. Engr. & Surveyor, 501 Cooper St., Camden, N. J. (Dec. '30)

Sloan, Joe, Supt., Water Dept., Waynesville, N. C. (Oct. '39)

Slocum, Edward M., Chem. Director, General Reduction Co., Macon, Ga. (Apr. '37)

Small, Leon, Water Engr., Bureau of Water Supply, 500 Municipal Bldg., Baltimore, Md. (Jan. '36)

Small, Sidney S., Meter Div., Worthington Co., 5075 Santa Fe St., Los Angeles, Calif. (July '35)

Smalley, James D., Supt., Water Dept., City Hall, Hayward, Calif. (Aug. '23)

Smalley, Russell C., Supt., Highland Park Water Dept., 411 Raritan Ave., Highland Park, N. J. (Jan. '39)

Smalshaf, A. J., Columbus Water Works, Columbus, Ga. (Dec. '16)

Smedberg, C. W., 315 Woodbine St., Greensboro, N. C. (Dec. '22) *Director '32–'34.*

Smith, A. C., Supt. & Operator, Matewan Water Works, P. O. Box

164, Matewan, W. Va. (Affil. Jan. '39)

Smith, A. P., Mfg. Co., Denis F. O'Brien, East Orange, N. J. (Assoc. M. June '97)

Smith, Benjamin L., Room 808, 11 N. Pearl St., Albany, N. Y. (June '30)

Smith, Bijah G., City Engr. & Water Supt., Camas, Wash. (Apr. '36)

Smith, Chester A., Cons. Engr., Burns & McDonnell Engineering Co., 107 W. Linwood Blvd., Kansas City, Mo. (Sept. '24)

Smith, David R., Director, Dept. of Works, 38 Wentworth St., St. John, N. B., Can. (Apr. '39)

Smith, Delbert D., Supt., Water Works Dept., City Hall, Santa Barbara, Calif. (Apr. '30)

Smith, E. E., Supt., Water Works, 119 W. High St., Lima, Ohio (July '35)

Smith, E. Vernon, Supt. of Public Works, Park Ridge, N. J. (Dec. '30)

Smith, Earl A., Salesman, Badger Meter Mfg. Co., Box 251, Ludington, Mich. (July '39)

Smith, Egmont S., Neptune Meter Co., 2014 Commerce St., Dallas, Tex. (Oct. '34) *Director '35–'36.*

Smith, Elmer, Supt. of Water Works, Munic. Water & Light Dept., Owensboro, Ky. (Apr. '39)

Smith, George F., *see* Barrie Water, Light & Gas Com.

Smith, Hal F., Sr. Admin. Asst., Dept. of Water Supply, 501 Water Board Bldg., Detroit, Mich. (June '29) *Diven Medal '39. Fuller Award '39.*

Smith, Herman H., Supt. of Water Dept., La Grange, Ind. (Jan. '38)

Smith, Ivan M. K., Supt. of Plant, Borough of Chatham, 11 Western Ave., Chatham, N. J. (Jan. '39)

Smith, J. F., Sales Mgr., Great Western Div., Dow Chemical Co., 9 Main St., San Francisco, Calif. (Dec. '31)

Smith, Joseph P., *see* Santa Ana Water Dept.

Smith, Leon A., Supt. of Water Works, City Hall, Madison, Wis. (May '16) *Director '31–'32, '35–'37. Fuller Award '32.*

Smith, Louis P., Pres. & Gen. Mgr., Farnan Brass Works Co., 1104 Center St., N. W., Cleveland, Ohio (July '38)

Smith, M. C., Chief Engr., Dept. of Public Utilities, 109 City Hall, Richmond, Va. (May '25) *Director '38-'40. Fuller Award '40.*

Smith, Meloy, 16 State St., Rochester, N. Y. (Mar. '34)

Smith, Moultrie, Supt., Water Dept., City Hall, Nacogdoches, Tex. (Oct. '39)

Smith, Murray M., Village Engr., 60 Hardy Rd., Village of Grosse Pointe Farms, Mich. (Apr. '39)

Smith, Nathanael J., Electrolysis Tester, Corrosion Lab., Dept. of Water & Power, 510 E. 2nd St., Los Angeles, Calif. (Oct. '34)

Smith, Neal D., City Mgr., City Hall, Ontario, Calif. (July '40)

Smith, O. M., Chemistry Dept., A. & M. College, Stillwater, Okla. (Feb. '28)

Smith, P. A., Treas., A. P. Smith Mfg. Co., 66 Stanley Rd., South Orange, N. J. (May '27)

Smith, R. Beverstock, (Mrs.), Vice-Pres. & Treas., The Farnan Brass Works Co., 1104 Center St., N.W., Cleveland, Ohio (July '38)

Smith, R. J., Mgr. & Secy.-Treas., Perth Public Utilities Com., Perth, Ont., Can. (June '11)

Smith, Robert T., Wallace & Tiernan Co., Inc., 414 Flour Exchange Bldg., Minneapolis, Minn. (July '30)

Smith, S. H., 140 Edgewood Ave., Atlanta, Ga. (July '35)

Smith, S. Morgan, Co., E. C. Brisbane, York, Pa. (Assoc. M. Mar. '34)

Smith, T. E., 140 Edgewood Ave., Atlanta, Ga. (July '35)

Smith, Vernon, Managing Director, John Thompson—Aust.-Pty. Ltd., 312 Flinders St., Melbourne, Australia (Jan. '35)

Smith, W. Austin, Cons. Engr., P. O. Box 1048, Jacksonville, Fla. (Dec. '26)

Smith, W. E., Dist. Mgr., Wallace & Tiernan Co., Inc., 415 Brainard St., Detroit, Mich. (Jan. '38)

Smith, Waymon, Water Works Supt., Marshall Field Co., Leaksville, N. C. (Jan. '39)

Smithson, Thomas, Cons. San. Engr., Gould Engineering Co., Pilot Butte Inn, Bend, Ore. (Apr. '40)

Smouse, John P., Jr., Route 2, St. Joseph, Mo. (June '31)

Smyre, R. E., *see* Hickory, City of

Snead, W. Ben, Asst. Sales Mgr., Lynchburg Foundry Co., Lynchburg, Va. (Jan. '39)

Snedeker, L. LeVern, City Chemist, 150 S. McKenzie St., Adrian, Mich. (May '30)

Snidow, Herman W., Sr. Asst. Engr., State Board of Health, Richmond, Va. (June '26)

Snow, Barton S., Pres. & Hyd. Engr., T. W. Snow Construction Co., 332 S. La Salle St., Chicago, Ill. (June '30)

Snow, Bayard F., Pres., X. Henry Goodnough, Inc., Engrs., 14 Beacon St., Boston, Mass. (Apr. '36)

Snow, J. A., Mgr., Water Dept., Ashland Water Utility, Ashland, Wis. (July '35)

Snyder, C. Albert, 738 N. Beatty St., Pittsburgh, Pa. (Jan. '39)

Snyder, M. K., Prof. of San. Eng., State College of Washington, Pullman, Wash. (Nov. '28)

Snyder, Robert F., Mgr., Toms River Water Co., 29 Snydew Ave., Toms River, N. J. (Jan. '37)

Socha, Max K., Civ. Engr., Dept. of Water & Power, Box 3669 Terminal Annex, Los Angeles, Calif. (Feb. '33)

Soderstrom, C. W., *see* Illinois Inspection Bureau

Soehren, W. L., Supt., Dallas Water Co., Dallas, Ore. (Dec. '30)

Solomon, Gabriel R., Pres., Solomon, Norcross & Keis, 257 Broadway, Troy, N. Y. (Nov. '25)

Solvay Sales Corp., J. V. Stauf, Asst. Director of Sales, 40 Rector St., New York, N. Y. (Assoc. M. Jan. '36)

Somers, Verne A., Supt., City Water Dept., Stevens Point, Wis. (May '38)

Sonderegger, A. L., Cons. Engr., 925 Central Bldg., Los Angeles, Calif. (Mar. '33)

Sopp, Claude W., Asst. Chief Engr., Pasadena Water Dept., 319 City Hall, Pasadena, Calif. (July '35)

Sopp, George C., Meter & Service Inspector, Bureau of Water Works & Supply, Box 3669 Terminal Annex, Los Angeles, Calif. (Apr. '36)

Sorelle, Donald, Supt. of Water Works, Acushnet, Mass. (Apr. '30)

South Jersey Assn. of Water Supts., Walter Spencer, Secy., 2707 Bethel Ave., Merchantville, N. J. (Corp. M. Apr. '31)

Southard, Alvin C., Mgr., Water Dept. of Inc. Village of Freeport, L. I., 46 N. Ocean Ave., Freeport, L. I., N. Y. (July '40)

Southern Alkali Corp., Santa Fe Bldg., Dallas, Tex. (Assoc. M. July '38)

Southern California Gas Co., G. H. Dieter, Gas Power Sales, 810 S. Flower St., Los Angeles, Calif. (Corp. M. Jan. '39)

Southern California Water Co., A. B. Muller, Secy.-Treas., 1206 S. Maple Ave., Los Angeles, Calif. (Corp. M. June '29)

Sowden, Howard J., Jr. Chemist, Minneapolis Water Dept., Fridley Filtration Plant, Minneapolis, Minn. (Affil. Jan. '39)

Spafford, H. A., Asst. San. Engr., Illinois Dept. Public Health, Capitol Bldg., Springfield, Ill. (Oct. '38)

Spalding, Geo. R., San. Engr., Hackensack Water Co., New Milford, N. J. (June '26)

Sparks, George H., City Hall, East Point, Ga. (July '35)

Sparks, Harry H., Dept. of Water & Power, Box 3669 Terminal Annex, Los Angeles, Calif. (Sept. '31)

Sparling, R. W., 945 N. Main St., Los Angeles, Calif. (Assoc. M. Nov. '25)

Sparling, Ray C., Pacific Coast Sales Mgr., R. W. Sparling Meter Co., 945 N. Main St., Los Angeles, Calif. (Oct. '39)

Spaulding, Charles H., Supervising Chemist, City Water, Light & Power Dept., Springfield, Ill. (July '24) *Goodell Prize '33.*

Specht, James E., Supt., Orrville Munic. Utilities, 1133 Perry St., Orrville, Ohio (Apr. '40)

Speiden, H. W., Dept. of Civ. Eng., West Virginia Univ., Morgantown, W. Va. (July '35)

Spellman, W. A., Township Engr., Kirkland Lake, Ont., Can. (Jan. '40)

Spence, W. O., Supt. of Filtration, Sanford, N. C. (Apr. '30)

Spencer, C. R., Asst. Gen. Sales Mgr., Lynchburg Foundry Co., Lynchburg, Va. (Jan. '39)

Spencer, W. R., Prof. of Civ. Eng., Univ. of Arkansas, Fayetteville, Ark. (Oct. '39)

Spencer, Walter, *see* South Jersey Assn. of Water Supts.

Sperry, S. M., Mech. Engr., 1804 Olive St., Reading, Pa. (July '35)

Sperry, Walter A., Chem. Engr., 733 S. Fourth St., Aurora, Ill. (Dec. '14)

Spokane, City of, Alex Lindsay, Supt., Water Div., Room 302, City Hall, Spokane, Wash. (Corp. M. Apr. '12) *Fuller Award '39.*

Sprangle, Bert, Supt. of Utilities, 216 E. 2nd St., Claremore, Okla. (Oct. '35)

Springer, John P., % Honolulu Iron Works, Honolulu, T. H. (Oct. '37)

Springfield City Water, Light & Power, S. T. Anderson, Admin. Asst., Springfield, Ill. (Corp. M. May '30)

Staeffler, W. C., Asst. Secy., Public Utilities Com., 817 Franklin St., Manitowoc, Wis. (Jan. '37)

Stager, Leo W., Hydrant & Valve Foreman, Montclair Water Bureau, 54 Watchung Ave., Montclair, N. J. (Affil. Jan. '39)

Stalbird, James A., State Dept. of Health, Paul Smith Bldg., Saranac Lake, N. Y. (Apr. '25)

Staley, H. H., Cons. Engr., 1156 Garfield Ave., Topeka, Kan. (July '38)

Stalker, W. D., *see* Simcoe Public Utilities Com.

Stanfield, A. C., Civ. Engr., Pana, Ill. (Dec. '14)

Stanger, W. H., Mgr., Munic. Water Dist., 1610 Cravens Ave., Torrance, Calif. (Oct. '37)

Stanley, C. M., Cons. Engr., Stanley Engineering Co., Box 731, Muscatine, Iowa (Sept. '32)

Stanley, William E., Prof. of San. Eng., Lincoln Hall, Cornell Univ., Ithaca, N. Y. (Nov. '20)

Stannard Power Equipment Co., H. V. Bowlby, 53 W. Jackson Blvd., Chicago, Ill. (Assoc. M. Jan. '38)

Stapley, Edward R., 27 College Circle, Stillwater, Okla. (July '37)

Starling, Charles H., Sales Engr., International Filter Co., 417 Fenton Pl., Charlotte, N. C. (July '38)

Starnes, Tom M., Southern Sales Mgr., American Cast Iron Pipe Co., P. O. Box 2603, Birmingham, Ala. (July '35)

Startzell, R. C., Supt. of Water Works, 224 W. Mahoning St., Punxsutawney, Pa. (Dec. '27)

Statham, Richard N., Industrial Chemical Sales Div., West Virginia Pulp & Paper Co., 417 Schofield Bldg., Cleveland, Ohio (Jan. '36)

Staub, William S., Engr., West Virginia Water Service Co., 814 Peoples Bank Bldg., Charleston, W. Va. (July '34)

Stauff, Paul V., City Chemist, Park Hotel, Eveleth, Minn. (Jan. '34)

Stava, William, Asst. Engr., Hydr. Div., California Railroad Com., 510 State Bldg., San Francisco, Calif. (May '27)

Stavrowsky, Paul A., Asst. Engr. of Water Dept., City of Santos Improvement Co., Ltd., Caixa Postal 4, Santos, Brazil, S. A. (Jan. '39)

Stead, Frank M., San. Engr., Los Angeles County Health Dept., 431 Grand Ave., South Pasadena, Calif. (Sept. '31)

Stearns, Harrington P., Long Island Water Corp., 337 Merrick Rd., Lynbrook, L. I., N. Y. (Jan. '14)

Steel Protection & Chemical Co., Inc., L. R. Rogers, Pres., Mooresville, Ind. (Assoc. M. Apr. '39)

Steel Tank & Pipe Co. of California, George H. Raitt, Vice-Pres., 1100 Fourth St., Berkeley, Calif. (Assoc. M. Aug. '26)

Steelman, Elmer S., Mgr., Ocean City Water Service Co., 10th St. & West Ave., Ocean City, N. J. (July '29)

Steenson, H. D., Secy., Water Works, Plano, Tex. (Oct. '39)

Steffani, E. C., Office Engr., Gas & Water Dept., Coast Counties Gas & Elec. Co., 22 Pacific Ave., Santa Cruz, Calif. (Jan. '39)

Stegeman, Paul, *see* Midland Water Dept.

Steinhauer, E., Local Mgr. Redding Dist., California Water Service Co., Box 233, Redding, Calif. (May '27)

Stenger, Jno. N., Engr., Water Dept., 3208 N. 21st Ave., Tacoma, Wash. (Apr. '40)

Stephenson, Frank H., 3652 Kingston Pike, Knoxville, Tenn. (May '20)

Stepleton, H. A., Engr., H. P. Jones & Co., 2012—2nd National Bank Bldg., Toledo, Ohio (Apr. '40)

Stepp, W. H., Filter Operator, Kermit, W. Va. (Affil. Jan. '39)

Sterling, City of, P. O. Box 308, Sterling, Colo. (Corp. M. Jan. '39)

Sterling Engine Co., M. E. Mutchler, Gen. Sales Mgr., 1270 Niagara St., Buffalo, N. Y. (Assoc. M. Apr. '37)

Stern, Sollis E., Supt., Frankfort Water Works Co., Frankfort, Ind. (May '33)

Sterns, Edward A., Supt., Water Dept., 207 Long Ave., Hamburg, N. Y. (Apr. '37) *Fuller Award '38.*

Stevens, James S., Supt. of Yards & Shops, East Bay Munic. Utility Dist., 2127 Adeline St., Oakland, Calif. (May '33)

Stevenson, Albert Henry, Asst. Engr., 25 W. 43rd St., New York, N. Y. (Jan. '40)

Stevenson, R. C., *see* Idaho Surveying & Rating Bureau

Stevenson, Ralph A., Cons. Chemist, 641 Gibbons St., Los Angeles, Calif. (Sept. '27)

Stewart, C. E., Supt., Muncie Water Works Co., 316 S. Mulberry St., Muncie, Ind. (Jan. '25)

Stewart, C. M., Supt., Water Dept., Bradford, Pa. (July '35)

Stewart, Elon P., *see* Syracuse Dept. of Engineering

Stewart, J. R., Town Engr., Renfrew, Ont., Can. (Jan. '37)

Stewart, Marion G., Supt., Natchez Water Works, Natchez, Miss. (Feb. '32)

Stewart, M. T., Mgr., Rockwood Water Co., 768 Grandview Ave., Rockwood, Pa. (Jan. '39)

Stewart, O. J., Supt., Water Works Dept., Greencastle, Ind. (Jan. '38)

Stickel, Chas. R., City Mgr., City of Melbourne, City Hall, Melbourne, Fla. (July '39)

Stiles, Arthur B., *see* Owego Water Works

Stillwell, Howard L., 225 Broadway, New York, N. Y. (Jan. '39)

Stilwell, Robert L., Supt., Water Dept., Southern Indiana Gas & Electric Co., Evansville, Ind. (July '35)

Stimmel, R. M., Chief Chemist, New York, Chicago & St. Louis R. R., Lima, Ohio (Apr. '30)

Stober, A. W., Repr., Neptune Meter Co., 1519 N.W. Johnson St., Portland, Ore. (July '34)

Stock, Harry, Civ. Engr., 4440 Abbott Ave., S., Minneapolis, Minn. (Jan. '39)

Stockman, R. C., Assoc. Cons. Engr., L. R. Stockman & Co., Box 584, Baker, Ore. (Apr. '40)

Stockner, L. J., Supt. of Filtration, Galax, Va. (Oct. '34)

Stockwell, Henry P., Jr., Chem. Engr., Ottawa Water Purif. Plant, Ottawa, Ont., Can. (Jan. '33)

Stokes, D. Birney, Vice-Pres., U. S. Pipe & Foundry Co., Burlington, N. J. (Oct. '35)

Stoldt, G. F., Supt., City Power & Water Plant, Jacksonville, Ill. (Dec. '22)

Stolk, Juan F., Director of Water Dept., Apartado Postal Num. 964, Caracas, Venezuela, S. A. (Jan. '36)

Stollard, Julian H., Jr. Chemist, Atlanta Water Works, 253—14th St., N.E. 16, Atlanta, Ga. (July '39)

Stolp, Amer C., Mgr., California Water Service Co., Marysville, Calif. (Nov. '33)

Stompler, Otto F., Supt., Langhorne Spring Water Co., Langhorne, Pa. (Jan. '26)

Stone, Myron D., *see* Oswego Dept. of Water

Stone, Robert R., Acting Supt. & Engr., Elizabethtown Water Co., Consolidated, 22 W. Jersey St., Elizabeth, N. J. (Jan. '39)

Stone, Wyman R., Laboratorio de Aguas, Ministerio de Obras Publicas, Caracas, Venezuela, S. A. (Jan. '38)

Storm, A. O., Trustee, City Water Works, 6 Oak St., Council Bluffs, Iowa (Jan. '39)

Storrie, William, Cons. Engr., Charles-Bay Bldg., 1130 Bay St., Toronto 5, Ont., Can. (Mar. '15)

Stosick, J. F., City Hall, South Milwaukee, Wis. (July '35)

Stott, Roy, Mgr., Light & Water Dept., Greenwood, Miss. (July '38)

Stout, T. A., Mgr., West Penn Water Co., McDonald, Pa. (Oct. '32)

Stover, Frederick H., Chemist & Bacteriologist, Crescent Hill Filter, Louisville Water Co., Louisville, Ky. (June '12)

Strader, Alfred A., Meter & Service Inspector, Dept. of Water & Power, 245 S. Harvard Blvd., Los Angeles, Calif. (Oct. '38)

Stradling, F. P., Supt., Kokomo Water Works Co., P. O. Box 369, Kokomo, Ind. (Dec. '24)

Straetz, A. G., 205 W. Wacker Drive, Chicago, Ill. (July '35)

Straight, P. D., Supervisor of Sanitation, Federal Industrial Institution for Women, Box 58, Alderson, W. Va. (Affil. Jan. '39)

Strang, John A., Div. Mgr., Wallace & Tiernan Sales Corp., 426 Board of Trade Bldg., Kansas City, Mo. (Feb. '23)

Strasser, R. J., Owner, R. J. Strasser Drilling Co., Route 3, Box 594, Portland, Ore. (Jan. '39)

Strathroy Public Utilities Com., A. E. Ditchburn, Mgr., Strathroy, Ont., Can. (Corp. M. Feb. '32)

Straub, Conrad P., McMullen Research Scholar, Cornell Univ., 806 E. Seneca St., Ithaca, N. Y. (Jr. M. Jan. '40)

Street, J. C., *see* Welland Board of Water Comrs.

Streeter, Robert L., Civ. Engr., Box 359, Gillette, Wyo. (Apr. '37)

Strickland, G. Hudson, Supt. of Filtration Plant, Windsor Utilities Com., Canada Bldg., Windsor, Ont., Can. (Mar. '29)

Strickler, Simon F., 1827 N. 2nd St., Harrisburg, Pa. (Jan. '37)

Strockbine, Walter, Chemist, 3424 Ryan Ave., Philadelphia, Pa. (June '27)

Strohmeyer, Joseph S., Distr. Engr., Bureau of Water Supply, 5007 Cordelia Ave., Baltimore, Md. (May '22)

Stromquist, W. G., 82 S. Crest Rd., Chattanooga, Tenn. (May '32)

Strother, Bryant L., Filter Plant Supervisor, Du Pont Rayon Co., Richmond, Va. (Jan. '35)

Strudgeon, J. C., Supt., Parkrose Water Dist., 10404 N. E. Sandy Blvd., Portland, Ore. (July '35)

Stuart, Archer B., *see* Healdsburg, City of

Stuart, Charles L., Supt., New Jersey Water Co., 610 Station Ave., Haddon Heights, N. J. (Jan. '40)

Stuart, Fred E., Activated Alum Corp., Curtis Bay, Baltimore, Md. (Oct. '31)

Stutz, C. N., 1308 N. Rosnoy Ave., Bloomington, Ill. (July '35)

Sudlow, Harry, Supt. of Water Works, Aiken, S. C. (Apr. '30)

Sullivan, William F., *see* Pennichuck Water Works

Summers, O. B., *see* New Mexico Power Co.

Sutcliffe, H. W., Civ. Engr., New Liskeard, Ont., Can. (July '35)

Suter, Max, Engr., State Water Survey, 405 W. Elm St., Urbana, Ill. (May '33)

Suter, Russell, Exec. Engr., Water Power & Control Com., Albany, N. Y. (Oct. '14)

Suters, Frank, Mgr., Chico-California Water Service Co., 121 Broadway, Chico, Calif. (Oct. '37)

Sutherland, Lois, (Miss), *see* Paducah Water Works

Sutherland, Oscar, Supt., Water Dept., Box 473, Sioux City, Iowa (June '27)

Svenson, S. H., Buffalo Sales Agent, U. S. Pipe & Foundry Co., 957 E. Ferry St., Buffalo, N. Y. (Apr. '37)

Swab, Bernal H., 713 First Ave., Altoona, Pa. (Mar. '30)

Swanson, Herbert S., Hydrographer, Bureau of Water Works & Supply, Box 3669 Terminal Annex, Los Angeles, Calif. (Oct. '34)

Swanson, J. L., Water Purif. Supt., 2238—18th St., Port Arthur, Tex. (Oct. '39)

Swartz, Martin, Supt., Water & Light Com., Greenville, N. C. (Dec. '24)

Swartz, W. E., *see* Preston Light and Water Com. on Public Utilities

Sweeney, R. E., New England Sales Agent, U. S. Pipe & Foundry Co., 250 Stuart St., Boston, Mass. (July '39)

Swett, Lewis A. W., Supt., Harwich Water Dept., P. O. Box 84, Harwich, Mass. (Aug. '30)

Swingley, Ralph L., Prin. Asst. in Accounting Dept., Indianapolis Water Co., 113 Monument Circle, Indianapolis, Ind. (Jan. '40)

Swinney, Guy H., Chief Chlorine Plant Operator, Bureau of Water Works & Supply, Box 3669 Terminal Annex, Los Angeles, Calif. (Oct. '37)

Swittenberg, R. L., Supt., Duke Power Co., Anderson, S. C. (Apr. '39)

Sybrandt, John L., Western Sales Mgr., Ludlow Valve Mfg. Co., 7 S. Dearborn St., Chicago, Ill. (Apr. '34)

Sydow, William, Cons. Engr., 2376 S. W. 21st St., Miami, Fla. (July '38)

Symes, Cyril B., City Engr., City Hall, Fort William, Ont., Can. (Apr. '38)

Symons, M. M., Chief Engr., Inter-State Water Co., Lock Box 803, Danville, Ill. (Feb. '15)

Syntron Co., D. G. Black, Homer City, Pa. (Assoc. M. Jan. '35)

Syracuse Dept. of Engr., Div. of Water, Elon P. Stewart, Engr., 400 City Hall, Syracuse, N. Y. (Corp. M. Jan. '23) *Fuller Award '39.*

Taber, George A., Cons. Engr., 1000 N. Main St., Reading, Mass. (June '12)

Taggart, Robert S., Dist. San. Engr., State Dept. of Health, 268 Guy Park Ave., Amsterdam, N. Y. (Apr. '37)

Tainter, F. S., Cons. Engr., Parsons, Klapp, Brinckerhoff & Douglas, Cons. Engrs., 142 Maiden Lane, New York, N. Y. (Oct. '19)

Tait, Robert S., Supt. of Water, 14 California St., Santa Cruz, Calif. (Oct. '25)

Tait, Wm., Supt. of Water Works, Picton, Ont., Can. (Apr. '34)

Takeuchi, R., Hirata, Ashiya, Seido-Mura, Mukogun, Hyogo-Ken, Japan (Dec. '27)

Talbot, Arthur N., Prof., Munic. & San. Eng., Univ. of Illinois, Urbana, Ill. (Aug. '94) *Honorary M. '30.*

Talbot, Earle, Vice-Pres., Hackensack Water Co., Box F, Weehawken, N. J. (May '20)

Talbott, R. A., Supt. of Water Works, Wellston, Ohio (July '37)

Tallant, Lee H., Water Supt., Estes Park, Colo. (Apr. '30)

Tallon, E. P., Supt., Dominguez Water Corp., R. 2, Box 215, Long Beach, Calif. (Jan. '39)

Tamer, Paul, Chemist, Hackensack Water Co., New Milford, N. J. (Jan. '39)

Tangney, Frank P., Salesman, National Meter Co., 5401 Woodlawn Ave., Seattle, Wash. (July '35)

Tanner, Clair D., *see* Holland Water Dist. No. 1

Tanner, J. R., 516—31st St., West Palm Beach, Fla. (Oct. '39) *Director '40.*

Tappen, Ray, Supt., Jericho Water Dist., Box 434, Glen Head, L. I., N. Y. (July '38)

Tarbell, W. P., City Engr. & Supt. Water Dept., P. O. Box 185, Fargo, N. D. (Feb. '28)

Tarlton, Ellis Alvord, Supervising Chemist, Salem-Beverly Water Supply Board, Filtration Plant, Arlington Ave., Beverly, Mass. (Apr. '39)

Tarr, Jesse, Chemist in Charge of Filtration, Wellsville Water Dept., 806 Main St., Wellsville, Ohio (Oct. '39)

Tassie, Gilbert C., R. R. 2, Coldstream, Vernon, P. O., British Columbia, Can. (Oct. '38)

Tate, Guy M., San. Engr., Jefferson County Health Dept., Box 2591, Birmingham, Ala. (Oct. '39)

Tate, H. L., Sr. Operator, Redlands City Water Dept., Mentone, Calif. (Oct. '38)

Tate Pipelinings, Inc., Bruce Harkness, 47 Haverhill St., Andover, Mass. (Assoc. M. Jan. '38)

Tatman, O. P., *see* Chillicothe Water Co.

Tatnall, George, Hydr. Engr., National Board of Fire Underwriters, 222 W. Adams St., Chicago, Ill. (Feb. '30)

Taulman, W. D., 179 Spring St., S.W., Atlanta, Ga. (July '35)

Tawney, Albert M., Supt., Water & Sewage, Fort George G. Meade, Md. (July '35)

Tay, Samuel Wright, San. Engr., Territorial Board of Health, Hawaii, 2413 Lower Manoa Rd., Honolulu, T. H. (July '20)

Taylor, Alex O., Director, Eng. Extension, Alabama Polytechnic Institute, Box 70, Auburn, Ala. (Oct. '39)

Taylor, Alva A., City Engr., & Water Supt., City Hall, Signal Hill, Calif. (Oct. '39)

Taylor, Arthur, *see* Beverly Hills Water Dept.

Taylor, D. C., Acting Office Mgr., Windsor Utilities Com., 2090 Wyandotte St., Walkerville, Ont., Can. (Jan. '35)

Taylor, D. R., Supt., City of Roanoke, Water Dept., 20 Salem Ave., E., Roanoke, Va. (Sept. '33)

Taylor, Floyd B., Eng. Asst., Pennsylvania Dept. of Health, 222 S. 49th St., Philadelphia, Pa. (Jr. M. July '39)

Taylor, Geo. R., San. Chemist, 135 Jefferson Ave., Scranton, Pa. (May '08)

Taylor, Henry R., Filtration Supt., East Bay Munic. Utility Dist., 714 Arbor Drive, San Leandro, Calif. (July '33)

Taylor, R. A., Repr., Layne-Texas Co., 4915 Abbott St., Dallas, Tex. (Oct. '39)

Taylor, Stephen H., Salters Point, S. Dartmouth, Mass. (June '19) *Trustee '29–'30. Director '31–'32.*

Taylor, Warren C., Assoc. Prof. of Civ. Eng., Union College, Schenectady, N. Y. (Oct. '24)

Teck, Township of, F. G. Browne, Supt. of Water Works, Kirkland Lake, Ont., Can. (Corp. M. Feb. '32)

Teed, R. H., *see* Hot Springs Water Co.

Tempest, W. F., *see* Portland Cement Assn.

Temple, F. C., Williams, Temple & Bartholomew, 28 Victoria St., Westminster, S. W. 1, England (Dec. '29)

Tennessee Eastman Corp., John Callan, Kingsport, Tenn. (Corp. M. Jan. '39)

Tenny, M. K., Chemist, Des Moines Water Works, 10th and Locust Sts., Des Moines, Iowa (Feb. '27)

Terrell, Robert C., Supt., Danville City Water Works, Danville, Ky. (Jan. '36)

Tessier, A. H., International Water Supply Co., 2521 Maplewood Ave., Montreal, Que., Can. (Jan. '37)

Tetzlaff, Frank, San. Engr., 181 Park Ave., Freeport, L. I., N. Y. (Jan. '36)

Texas Technological College Library, Lubbock, Tex. (Corp. M. Jan. '40)

Thacker, E. H., Asst. Supt., Meter & Service Dept., Water Distr. Div., Dept. of Water & Power, 468

Ducommun St., Los Angeles, Calif. (Oct. '29)

Thane, H. S., Supt., Missoula Div., Montana Power Co., Missoula, Mont. (Apr. '26)

Thatcher, Lynn M., Director, Div. of Public Health & San., Utah State Board of Health, State Capital, Salt Lake City, Utah (Oct. '37)

Thayer, E. S., Sales Repr., Mathieson Alkali Works, Inc., 410 N. Michigan Ave., Chicago, Ill. (July '35)

Thayer, Neal B., *see* Elkhorn Light & Water Com.

Theobald, Jerome J., Commercial Engr., Westchester Lighting Co., 9 S. First Ave., Mount Vernon, N. Y. (Mar. '34)

Thibodeaux, E. A., Supt., Munic. Light & Water Plant, Thibodaux, La. (Apr. '40)

Thiessen, Frank C., Cons. Engr., Public Service Com., Madison, Wis. (Oct. '24)

Thomas, A. H. R., *see* New Toronto Public Utilities Com.

Thomas, Ariel Alton, State & Trust Bank Bldg., Highland, Ill. (Jan. '38)

Thomas, Charles F., Dist. Mgr., Pittsburgh Equitable Meter Co., 607 Iroquois Bldg., Buffalo, N. Y. (Apr. '37)

Thomas, Charles O., Supt., Water & Light Plant, Hope, Ark. (Jan. '40)

Thomas, David S., Inspecting Engr., Board of Fire Underwriters of the Pacific, 1106 Second Ave., N., Great Falls, Mont. (Feb. '27)

Thomas, E. R., Supt., Munic. Water Dept., Burlington, N. C. (Jan. '36)

Thomas, Edgar, Supt. of Water Works, Box 205, Yreka, Calif. (June '27)

Thomas, F. B., Thomas Drain Service, 616 Sunset View Drive, Akron, Ohio (Apr. '40)

Thomas, Franklin, Prof. of Civ. Eng., California Institute of Technology, Pasadena, Calif. (Mar. '30)

Thomas, Ken C., Sales Mgr., Virginia Culvert Corp., P. O. Box 415, Richmond, Va. (July '38)

Thomas, Norton A., Chief Chemist, Milwaukee Water Works, 3353 N. Frederick Ave., Milwaukee, Wis. (May '30)

Thomas, R. Allen, Comr. of Public Works, City Hall, Winston-Salem, N. C. (Apr. '36)

Thomas, R. B., City Engr., Highland Park, Tex. (Oct. '39)

Thomas, T. W., Peoples Water Co., Phillipsburg, N. J. (Apr. '36)

Thompsen, Albert, Meter Shop Foreman, Munic. Water Dept., 3516 S. 47th Ave., Minneapolis, Minn. (Apr. '38)

Thompson, David G., Water Resources Branch, U. S. Geological Survey, Washington, D. C. (Sept. '24) *Goodell Prize '39.*

Thompson, E. W., Northwestern Mgr., Neptune Meter Co., 1519 N. W. Johnson St., Portland, Ore. (Dec. '27)

Thompson, H. E., Engr., Univ. of North Carolina, Chapel Hill, N. C. (Dec. '33)

Thompson, H. Loren, *see* Idaho, Univ. of

Thompson, H. M., Mgr., Hercules Powder Co., P. O. Box 135, Station A, Atlanta, Ga. (Jan. '38)

Thompson, John D., Hotel Onondaga, Syracuse, N. Y. (Oct. '29)

Thompson, L. W., Supt., City Water Dept., 272 N. Cambridge St., Orange, Calif. (July '39)

Thompson, Leonard N., Gen. Supt. & Engr., Water Dept., St. Paul, Minn. (Apr. '29) *Director '37–'39.*

Thompson, N. J., Sales Mgr., Thompson Mfg. Co., 3001 Larimer St., Denver, Colo. (Oct. '39)

Thompson, Rudolph E., Chemist, Filtration Plant, 445 Parkside Drive, Toronto 3, Ont., Can. (Mar. '22)

Thompson, S. A., Chief Engr., Citizens Water Co., Burlington, Iowa (July '35)

Thomson Meter Co., R. K. Blanchard, Vice-Pres., 50 W. 50th St., New York, N. Y. (Assoc. M. Apr. '91)

Thornton, Grover L., Supt., City Water Dept., Kelso, Wash. (Apr. '37)

Thornton, Gustavus, Cons. Engr., 205-7 Cary Bldg., Owensboro, Ky. (Apr. '39)

Thornton, J. S., *see* Federal Advisers, Inc.

Thorp, D. W., Hamlet Water Co., Hamlet, N. C. (July '35)

Thorson, W. R., Mgr., Munic. Light & Water Dept., 127 E. 3rd St., Muscatine, Iowa (Oct. '37)

Thrasher, W. E., Gen. Supt., Westchester Joint Water Works No. 1, Mamaroneck, N. Y. (Jan. '37)

Thuma, R. A., Supt., Filter Plant, Water Dept., R.F.D. No. 4, Dayton's Bluff P. O., St. Paul, Minn. (Mar. '25)

Tighe, James L., Cons. Engr., 189 High St., Holyoke, Mass. (Apr. '89) *Honorary M. '26.*

Tilbury Public Utilities Com., G. S. Richardson, Comr., Tilbury, Ont., Can. (Corp. M. Apr. '34)

Timanus, C. S., Burns & McDonnell Eng. Co., 107 W. Linwood Blvd., Kansas City, Mo. (May '31)

Timmins, Corporation Town of, J. D. McLean, Town Engr., Box 433, Timmins, Ont., Can. (Corp. M. Feb. '33)

Tinnie, Donald, Supt. of Water, Port Ewen, N. Y. (Affil. Jan. '39)

Tisdale, Ellis S., San. Engr., Ohio River Pollution Survey, 1309 Enquirer Bldg., 617 Vine St., Cincinnati, Ohio (Aug. '16)

Titus, Robert L., Topographical Draftsman, Bureau of Water Works & Supply, Box 3669 Terminal Annex, Los Angeles, Calif. (July '38)

Tobin, L. P., Supt. & Treas., Munic. Water & Light Dept., Camden, S. C. (Jan. '32)

Todd, Arthur R., Chemist, Wheeling Water Dept., Water Works, Warwood, Wheeling, W. Va. (Apr. '34)

Toews, C. A., Supt., Dinuba Water Dept., Dinuba, Calif. (Oct. '37)

Tolburg, H. A., 2020 S. 5th St., Springfield, Ill. (July '35)

Tolles, Frank C., Civ. & San. Engr., Leader Bldg., Cleveland, Ohio (Aug. '23)

Tolman, S. L., Mgr. of Sales, San. Eng. Div., The Jeffrey Mfg. Co., Columbus, Ohio (July '35)

Toman, R. S., Chief Chemist, Chemical Equipment Co., 911 Harrison St., San Francisco, Calif. (Jan. '40)

Tomek, Arthur O., Filter Plant Supt., Two Rivers, Wis. (Oct. '35)

Tomlinson, W. J., Chem. Engr., 906 New Wellington Bldg., 137 Wellington St., W., Toronto, Ont., Can. (July '38)

Tomlinson, W. S., City Engr., Columbia, S. C. (July '37)

Tompkins, H. G., *see* Emporium Water Co.

Toms, J. H., Supt. of Filtration, Water Dept., 206 Lee St., Shelby, N. C. (Jan. '40)

Toms, R. C., Mgr., Marion Water Co., Marion, Iowa (Apr. '24)

Tonglet, Karel H., City Water Supt., City Hall, Monrovia, Calif. (Oct. '37)

Topham, W. C., Asst. Chief Chemist, Electro Metallurgical Co., Alloy, W. Va. (Affil. Jan. '39)

Toronto Dept. of Works, R. C. Harris, Comr. of Works, City Hall, Toronto 2, Ont., Can. (Corp. M. Jan. '35)

Torriente, Esteban R., Chief Engr., Public Works Dept., Prado 190 Altos, Cienfuegos, Cuba (Jan. '40)

Towne, James E., Supt., Water & Light Dept., North Forest St., Waupun, Wis. (Oct. '35)

Towne, W. W., Director, Div. of San. Eng., State Board of Health, Capitol Annex, Pierre, S. D. (Dec. '29)

Towns, J. E., Asst. Mgr., General Chemical Co., 105 W. Madison St., Chicago, Ill. (Oct. '37)

Townsend, C. P., Supt. of Water Works, Abbeville, S. C. (July '35)

Townsend, Fred W., 2411 Ivanhoe Drive, Los Angeles, Calif. (Apr. '33)

Townsend, Hal. C., 900 Meridan Ave., Dearborn, Mich. (Jan. '38)

Tracy, Harry W., Jr. Water Purif. Engr., San Francisco Water Dept., Millbrae, Calif. (Jan. '40)

Tracy, J. E., Engr., The Pitometer Co., 1215 State Bank Bldg., 75 State St., Albany, N. Y. (Jan. '37)

Tracy, R. N., Civ. Engr., Hardesty Mfg. Co., Box 2170, Denver, Colo. (Jan. '35)

Trauger, George W., Supt., Lindsay Strathmore Irrigation Dist., Lindsay, Calif. (Nov. '25)

Traver, Leslie J., Supt. Pumping Plant, East Bay Munic. Dist., 512 16th St., Oakland, Calif. (May '33)

Traverse City Iron Works, H. O. Joynt, Pres., Traverse City, Mich. (Assoc. M. July '38)

Travis, A. Raymond, Jr., Turbine Equipment Co., Midland Park, N. J. (Oct. '38)

Travis, F. M., Pres., Torrington Water Co., P. O. Box 76, Torrington, Conn. (July '17)

Trax, E. C., Chemist, Filtration Plant, McKeesport, Pa. (June '11) *Fuller Award '39. Director '40-'41.*

Trentlage, La Verne, Foreman, Meter Div., Elgin City Water Dept., 212 Jefferson Ave., Elgin, Ill. (Apr. '36)

Trenton Water Works, Frank M. Winder, Director, 657 Calhoun St., Trenton, N. J. (Corp. M. May '09)

Trimble, Roswell D., R. D. Trimble & Co., Cons. & Const. Engrs., American Bldg., Richmond, Va. (July '37)

Trout, Clarence L., Gen. Foreman, Harrisen Elec. & Water Co., 323 Plum St., Cincinnati, Ohio (Jan. '39)

Trowbridge, Charles E., American Water Works & Elec. Co., 50 Broad St., New York, N. Y. (Mar. '29)

Troy Bureau of Water, William Luby, Troy, N. Y. (Corp. M. May '24)

True, Albert O., San. Engr., Denim Branch, Proximity Mfg. Co., Greensboro, N. C. (Aug. '22)

Trueblood, V. B., Secy., Waterloo Water Works, Waterloo, Iowa (Dec. '33)

Truesdale, William, Supt. of Water Works, Victoria Ave., Essex, Ont., Can. (Jan. '37)

Truman, Chester A., Supt., Northfield Land & Water Co., 3011 N. Tejon St., Colorado Springs, Colo. (Dec. '26) *Director '38-'40.*

Trunkey, C. F., Water Comr., Water Dept., 814—14th St., Bellingham, Wash. (Affil. Apr. '40)

Tull, E. R., Supt., Munic. Water Plant, Rockingham, N. C. (Jan. '35)

Tulsa Water Dept., Tulsa, Okla. (Corp. M. June '29)

Turley, Comer, Mech. Supt., Pepperell Mfg. Co., Lindale, Ga. (July '37)

Turner, A. J., *see* Washington Water Power Co.

Turner, Charles D., Dist. Mgr., Wailes Dove-Hermiston Corp., 401 N. Broad St., Philadelphia, Pa. (Apr. '37)

Turner, Homer G., Research Engr., State College, Pa. (Sept. '32)

Turner, James V., Supt., East Providence Water Dept., Rumford, R. I. (July '38)

Turner, W. D., Prof. of Chem. Eng., Columbia Univ., New York, N. Y. (May '31)

Turping, J. P., Mgr., Armstrong Water Co., 204 Arch St., Kittanning, Pa. (Affil. July '39)

Turre, George J., San. Engr., Board of Water Comrs., Box 629, Denver, Colo. (Nov. '27)

Tuscaloosa, City of, C. S. Read, Supt. of Water Works, Tuscaloosa, Ala. (Corp. M. Jan. '35)

Tuttle, Arthur S., Cons. Engr., 101 Park Ave., New York, N. Y. (July '16)

Tvargosky, P. A., City Water Works, Vicksburg, Miss. (Feb. '30)

Twining, R. H., Mgr., Development Dept., Gray Chemical Co., Roulette, Pa. (Oct. '38)

Two Harbors, City of, Carl F. Barr, Supt. of Utilities, Two Harbors, Minn. (Corp. M. Apr. '39)

Tygert, Cyril B., Dist. Mgr., Wallace & Tiernan Co., Inc., Box 178, Newark, N. J. (Oct. '35)

Tyler, O. Z., Supt., Elec. Production & Water Dept., Utilities Bldg., Jacksonville, Fla. (Jan. '27)

Tyler, Richard G., College of Eng. Univ. of Washington, Seattle, Wash. (Feb. '31)

Uban, Carlos Gonzalez, Chief Engr. of Public Works, Ificina de Obras Publicas, Valera, Estado, Trujillo, Venezuela, S. A. (Apr. '40)

Ullrich, A. H., Purif. Engr., Water Dept., Fort Smith, Ark. (Oct. '35)

Ulrich, A. A., Mgr., Massillon Div., Ohio Water Service Co., 50 Charles Ave., S.E., Massillon, Ohio (June '31)

Ulrich, Bernard L., Ulrich Bldg., Manhattan, Kan. (Feb. '22)

Umbenhauer, Elwood J., San. Engr., Water Dept., Central Power & Light Co., Laredo, Tex. (Oct. '35)

Underwood, Golden, Supt., Parkersburg Water Dept., City Bldg., Parkersburg, W. Va. (Oct. '38)

Underwood, J. E., Cons. Engr., 102 Grain Bldg., Saskatoon, Sask., Can. (Jan. '37)

United States Pipe & Foundry Co., Thomas Simons, Southern Sales Mgr., 1711 American-Traders Bank Bldg., Birmingham, Ala. (Assoc. M. Nov. '29)

United States Pipe & Foundry Co, H. Lloyd Nelson, 1624 Lincoln-Liberty Bldg., Broad & Chestnut Sts., Philadelphia, Pa. (Assoc. M. June '92)

United States Steel Corp., C. R. Moffatt, Director of Exhibits, 434 Fifth Ave., Pittsburgh, Pa. (Assoc. M. Jan. '36)

Universal Gear Corp., 19th & Martindale Ave., Indianapolis, Ind. (Assoc. M. May '34)

Urueta F., Eduardo Chem. Engr., Apto. No. 186, Barranquilla, Colombia, S. A. (Sept. '29)

Utrechtsche Waterleiding-Maatschappij, 15 Predikheerenkerkhof, Utrecht, Holland (Corp. M. Nov. '22)

Vagnozzi, I., Comr. Water Dept., Youngstown, Ohio (Apr. '40)

Vail, H. P., 1316 Graynold Ave., Glendale, Calif. (Oct. '39)

Valazquez, Jose Mendez, *see* Mexico Banco Nacional Hipotecario Urbano y de Obras Publicas, S. A.

Vallee, Antonio, San. Engr., Public Health Service, Apartado #1442, Havana, Cuba (July '38)

Valenzuela, Juan, Pres., Junta de Aguas y Saneamiento, Chihuahua, Mexico (July '40)

Van Arnum, William I., Chem. Engr., Mahoning Valley San. Dist., 402 Glenwood Ave., Youngstown, Ohio (Feb. '22)

Van Benschoten, Jay, Mech. & Water Works Engr., 58 Pelham Ave., West Toronto, Ont., Can. (June '23)

Van Brunt, J. K., Boro Supt., 25 Union Ave., Manasquan, N. J. (July '38)

Van Camp, Paul M., Civ. Engr., Southern Pines, N. C. (Nov. '31)

Vance, L. S., Chief Engr. & Supt., Louisville Water Co., 435—3rd St., Louisville, Ky. (Apr. '38) *Fuller Award '38.*

Vancouver Water Dept., Rex R. Osborn, Supt., Vancouver, Wash. (Corp. M. Apr. '40)

Van Den Berg, C., Jr., Federal Water Service Corp., 90 Broad St., New York, N. Y. (Apr. '27)

Van Deusen, E. J., Supt., Malone Village Water Works, 21 Pearl St., Malone, N. Y. (Feb. '25)

Van Gilder, John M., Sales Engr., Wallace & Tiernan Co., 828 Braniff Bldg., Oklahoma City, Okla. (Oct. '39)

Van Gilder, L., Engr. & Supt., Water Dept., City Hall, Atlantic City, N. J. (July '06) *Fuller Award '40.*

Van Horn, R., *see* General Management Corp.

Van Liew, Wm. M., Water Supt., Okanogan, Wash. (Dec. '28)

Van Loan, Seth M., Chief, Bureau of Water, 801 City Hall Annex, Philadelphia, Pa. (May '14) *Trustee '28-'30. Director '34-'36.*

Van Norman, Claude H., Sales Repr., Johns-Manville Sales Corp., 1207 Architects Bldg., Los Angeles, Calif. (Oct. '38)

Van Norman, H. A., *see* Los Angeles Dept. of Water & Power

Vannoy, F. R., P. O. Box 389, Madisonville, Ky. (Jan. '38)

Van Patten, C., Mgr., Salem Water Dept., 304 S. Commercial St., Salem, Ore. (Jan. '36)

Van Patter, Hugh Stanley, Hydr. Engr., Dominion Eng. Works, Ltd., Montreal, Que., Can. (Apr. '32)

Van Praag, Alex, Jr., Vice-Pres. & Secy., Warren & Van Praag, Inc., 416 Millikin Bldg., Decatur, Ill. (Jan. '38)

Van Reenen, W. J., Sales Mgr., American Norit Co., Inc., 551 Fifth Ave., New York, N. Y. (Jan. '39)

Van Trump, S. N., Wilmington Suburban Water Co., Bellevue, Del. (July '35)

Van Wert, Fred, Jr., Supt. of Distr., Borough of Chatham, South Blvd., Chatham, N. J. (Jan. '39)

Vaughan, E. A., *see* Lompoc Light & Water Dept.

Vaughan, J. L., Supt., Water Dept., Box 397, Pendleton, Ore. (Jan. '37)

Vaughn, J. C., Supt. of Filtration & Pumping, Dept. of Water Works, 5941 Calumet Ave., Hammond, Ind. (Jan. '36)

Veador, E. F., Dist. Supt., West Virginia Water Service Co., Charleston, W. Va. (Mar. '29)

Veale, F. J., Supt. of Water Works, Hamilton, Ont., Can. (Apr. '31)

Veatch, N. T., Jr., Cons. Engr., 4706 Broadway, Kansas City, Mo. (Dec. '15)

Velz, C. J., Prof. of San. Eng. Manhattan College, Spuyten Duyvil Parkway, New York, N. Y. (Jan. '35)

Velzy, Charles R., Works Supt., % Buffalo Sewer Authority, Foot of W. Ferry St., Buffalo, N. Y. (Apr. '37)

Ventura City Water System, Chas F. Zapf, Supt., P. O. Box 1010, Ventura, Calif. (Corp. M. Jan. '36)

Vermeule, Cornelius C., Civ. Engr., 38 Park Row, New York, N. Y. (June '09)

Vernon, City of, Francis Bates, City Engr., 4305 Santa Fe Ave., Vernon, Calif. (Corp. M. Jan. '37)

Suburban Water Co., A. G. Garvin, Vice-Pres., 748 Allegheny River Blvd., Verona, Pa. (Corp. M. Apr. '09)

Vest, W. E., Supt. of Water Works, Charlotte, N. C. (May '11) *Director '31.*

Vicentini G., Jorge, San. Engr., Ministerio de Obras Publicas, Aptdo. No. 304, Caracas, Venezuela, S. A. (Jan. '39)

Vicini, H. C., Dist. Supt., Southern California Water Co., 1810 Pacific Ave., Venice, Calif. (Jan. '40)

Vickrey, John U., Operator, Fort Lauderdale Water Dept., 1118 West Los Olas Blvd., Fort Lauderdale, Fla. (Affil. July '39)

Vieno, R. R., Supt., Dist. Water Dept., City Hall, Beaumont, Tex. (July '38)

Villa-Acosta, Alfonso, Civ. Engr., 9a Calle de la Rosa 213, Mexico, D. F., Mexico (Apr. '30)

Vincenz, J. L., Comr. of Public Works, City Hall, Fresno, Calif. (Oct. '38)

Vinick, Albert G., *see* East Chicago Dept. of Water Works

Voden, Stewart, Water Plant Operator, Great Falls Water Works, 1405—7th Ave., S., Great Falls, Mont. (Jan. '39)

Voelker, Eugene J., Supt., Town of Lake Waterworks, 4001 S. 6th St., Milwaukee, Wis. (Jan. '40)

Vogt Mfg. Co., E. L. Vogt, P. O. Box 1122, Louisville, Ky. (Assoc. M. May '25)

Vojcsik, Lipot, Civ. Engr., Boraros Ter 6.IV.1., Budapest IX, Hungary (July '26)

Volk, Kenneth Q., 176 N. Highland Ave., Los Angeles, Calif. (Oct. '26)

Vollmar, Otto, Director, Dresden Water Works, Brockhausstrasse 3, Dresden, N.8, Germany (Mar. '25)

Volpp, A. G., Water Supt., West Linn, Ore. (Apr. '39)

Von Greyerz, Walo, Major Royal Swedish Corps, Engrs., Humlegardsgatan, 29, Stockholm, Sweden (July '20)

Voorhees, George G., Water Supt., Brielle, N. J. (Oct. '37)

Vrooman, Morrell, Cons. Civ. Engr., Gloversville, N. Y. (June '13)

Vybiral, George E., Chem. Engr., Roslyn Heights, L. I., N. Y. (Jr. M. Jan. '40)

Wachter, R. E., Asst. Engr., Missouri Pacific Ry., 1200 Missouri Pacific Bldg., St. Louis, Mo. (Jan. '34)

Waddell, W. H., Supt., Water Dept., City Hall, Owen Sound, Ont., Can. (July '35)

Waddington, Arthur H., Chemist & Bacteriologist, 23 Torver Rd., Harrow, Middlesex, England (June '34)

Wade, Jeptha A., California Water Service Co., P. O. Box 1150, San Jose, Calif. (May '31)

Wafer, Joseph M., Industrial Chemical Sales Div., West Virginia Pulp & Paper Co., 230 Park Ave., New York, N. Y. (Jan. '37)

Wagenhals, H. H., Assoc. San. Engr., State Dept. of Health, 411 Herald Bldg., Syracuse, N. Y. (July '37)

Wager, C. L., Postmaster, Heflin, Ala. (Affil. Jan. '40)

Wages, R. E., Supt. of Water Works, Springdale, Ark. (Jan. '36)

Wagner, A. H., Supt., Public Water Works Dist. #2, 119 E. Abriendo Ave., Pueblo, Colo. (Mar. '28)

Wagner, C. F., Engr., Oregon Insurance Rating Bureau, P. O. Box 70, Portland, Ore. (Nov. '25)

Wagner, Edward P., Civ. & San. Engr., 55 W. 42nd St., New York, N. Y. (Jan. '37)

Wagner, Edwin B., Supt. of Water Works, Downingtown, Pa. (Apr. '21)

Wagner, Richard E., Vice-Pres., Zeolite Chemical Co., Church Rd., Medford, N. J. (July '37)

Wagner, Richard F., Supt. & Engr., Dept. of Water, Lynchburg, Va. (Nov. '19)

Wailes Dove-Hermiston Corp., Linden Stuart, Pres., Westfield, N. J. (Assoc. M. Mar. '25)

Waite, Harry E., *see* San Fernando Water Dept.

Waite, Howard, Engr., Dept. of Water & Power, 410 Ducommun St., Los Angeles, Calif. (Apr. '40)

Wakefield, J. W., Asst. Engr., State Board of Health, Jacksonville, Fla. (Apr. '40)

Waldeck, Kenneth, Operator, Potomac Light & Power Co., Sheperdstown, W. Va. (Affil. Jan. '39)

Walker, Carl C., Sr., Cons. Engr., The Jennings-Lawrence Co., 538 Rowlands Bldg., Columbus, Ohio (Jan. '24)

Walker, Charles L., Prof. of San. Eng., Cornell Univ., Ithaca, N. Y. (May '30)

Walker, Edward L., Asst. Hydr. Engr., Public Service Com., 80 Centre St., New York, N. Y. (Jan. '34)

Walker, Elton D., 704 McKee St., State College, Pa. (July '06)

Walker, John A., Water & Elec. Supt., Stroud, Okla. (Oct. '39)

Walker, Joseph H., Plant Chemist, Louisville Cement Co., Speed, Ind. (July '38)

Walker, Lewie D., Water Works Engr., Canadian Underwriters' Assn., Metropolitan Bldg., Toronto, Ont., Can. (Feb. '21)

Walker, Merton G., Water Chemist, Hiram Walker & Sons, Inc., Peoria, Ill. (Jan. '39)

Walker, W. Blaine, Supervisor of Meter Readers, Atlanta Water Works, City Hall, Atlanta, Ga. (Jan. '40)

Walker, Walter E., Chief Engr., Water Works, North Rd., Poughkeepsie, N. Y. (Mar. '29)

Wall, Edward E., Director of Public Utilities, City Hall, St. Louis, Mo. (June '04) *Trustee '24-'26. Honorary M. '36.*

Wall, George Albert, P. O. Box Metro. 6254, Los Angeles, Calif. (Jan. '38)

Wall, Leo, City Engr., 902 Park Ave., Miamisburg, Ohio (Apr. '40)

Wall, V. M., Pacific Coast Sales Mgr., National Cast Iron Pipe Co., 1115 S. Hope St., Los Angeles, Calif. (Oct. '29)

Wallace & Tiernan Co., Inc., Box 178, Newark, N. J. (Assoc. M. Apr. '15)

Wallace, Donald S., Dist. Engr., U. S. Geological Survey, Ocala, Fla. (May '34)

Wallace, Ralph R., Investigator, 801 Preston, Houston, Tex. (Oct. '39)

Wallace, William M., Supt. of Filtration, Water Works Park, Detroit, Mich. (Apr. '22)

Wallene, Frank O., 3304 W. 162nd St., Cleveland, Ohio (Jan. '36)

Waller, R. O., Jr. San. Engr., Div. of Water Purif., Bureau of Eng., Navy Pier, Chicago, Ill. (May '33)

Wallis, L. E., Supt., Water & Light Dept., Elberton, Ga. (Feb. '33)

Walters, Grover L., Supt. of Water Works, City Hall, 123 W. Wilshire, Fullerton, Calif. (Oct. '30)

Walthall, E. B., Vice-Pres., California Water Service Co., 365 B. St., San Mateo, Calif. (Oct. '31)

Walvoord, D. J., Big Timber, Mont. (Jan. '36)

Wang, Sigmund, Mgr. of Labs., Canadian International Paper Co., Hawkesbury, Ont., Can. (Jan. '39)

Ward, Clayton N., 1835 Rowley Ave., Madison, Wis. (June '30)

Ward, Harry W., Chief Chemist, 2122 First St., Wyandotte, Mich. (Jan. '38)

Ward, Joe E., Montgomery & Ward, Cons. Civ. Engrs., 545 Harvey-Snider Bldg., Wichita Falls, Tex. (June '26)

Ward, R. E., 302 Hildebrandt Bldg., Jacksonville, Fla. (July '35)

Warde, John S., 7 Whitewood Ave., West Brighton, S. I., N. Y. (May '30)

Wardel, J. McClure, *see* Hudson Dept. of Public Works

Warder, Charles, Supt. of Water Works, Niagara Falls, Ont., Can. (Jan. '16)

Ware, Howard T., Engr., Central Foundry Co., Box 502, Union, N. Y. (July '35)

Waring, F. Holman, Chief Engr., State Dept. of Health, Columbus, Ohio (Feb. '15)

Warner, G. B., *see* Purity Springs Water Co., Inc.

Warner, J. M., 1000 Steele St., Denver, Colo. (July '35)

Warren, E. K., *see* West Lafayette Water Works Co.

Warren Foundry & Pipe Corp., J. H. Morrison, Vice-Pres., 11 Broadway, New York, N. Y. (Assoc. M. Mar. '11)

Warren, J. B., Director of Biology, Brockway Testing Labs., Box 43, DuBois, Pa. (Apr. '30)

Warren, W. D. P., Pres., Warren & Van Praag, Inc., 416 Millikin Bldg., Decatur, Ill. (Jan. '38)

Warrenton Water Co., Harold R. Skillman, Supt., Water Dept., Warrenton, N. C. (Corp. M. Nov. '28)

Warrick, Louis F., State San. Engr., State Board of Health, Madison, Wis. (Apr. '20) *Fuller Award '40.*

Wartelle, C. L., City Engr., City Eng. Dept., County City Bldg., Seattle, Wash. (Apr. '39)

Washington Suburban Sanitary Com. Hyattsville, Md. (Corp. M. May '30)

Washington Water Power Co., A. J. Turner, Box 1445, Spokane, Wash. (Corp. M. Nov. '30)

Water Leak Detector Co., S. F. Ferguson, Mgr., 166 N. 3rd St., Columbus, Ohio (Assoc. M. Apr. '37)

"Water Works & Sewerage," 330 S. Wells St., Chicago, Ill. (Assoc. M. June '29)

"Water Works Engineering," Editorial Dept., 24 W. 40th St., New York, N. Y. (Assoc. M. June '19)

Water Works Supply Co., C. B. Abbott, 501 Howard St., San Francisco, Calif. (Assoc. M. Apr. '28)

Waterman, Earle Lytton, Prof. of San. Eng., 104 Engineering Hall, Univ. of Iowa, Iowa City, Iowa (Dec. '22) *Director '39-'41.*

Waterous, C. A., *see* Brantford Utilities Com.

Waterous Company, Fred A. Waterous, St. Paul, Minn. (Assoc. M. Apr. '39)

Watkins, J. S., Cons. Engr., 564-5-7 McClelland Bldg., Lexington, Ky. (Aug. '33)

Watkins, Samuel C., Supt., Water Dept., Aberdeen, Wash. (Apr. '29)

Watkins, William W., Supt., Water Dept., 130 East St., Oneonta, N. Y. (June '22)

Watson, David J., Supt. of Bldgs. & Grounds, Clemson Agricultural College, Clemson, S. C. (Jan. '39)

Watson, H. G., City Engr., 801 E. 17th St., Cheyenne, Wyo. (Oct. '38)

Watson, Kenneth S., Chem. Engr., West Virginia State Water Com., Div. of San. Eng., Charleston, W. Va. (Affil. Jan. '39)

Watson, Pat, Supt., Colfax Munic. Water Works, Colfax, La. (Oct. '39)

Watson, Robt G., Supt., Power-Plant & Waterworks Dept., Edmonton, Alta., Can. (Apr. '39)

Watson, W. S., Supt., Board of Public Works, Water Dept., City Hall, Hannibal, Mo. (Jan. '40)

Weagraff, Chas. R., Supt., 41 Main St., Salamanca, N. Y. (July '35)

Weatherford, L. L., Supt., Atchison Water Co., P. O. Box 374, Atchison, Kan. (May '30)

Weaver, Allen J., Box #628, Jacksonville, Fla. (July '35)

Weaver, E., Mgr., Petrolia Public Utilities Com., Petrolia, Ont., Can. (Affil. Jan. '40)

Weaver, Stuart M., Supt., Water Bureau, Montclair, N. J. (Jan. '25)

Weaver, W. H., City Engr. & Supt. Water Works, City Hall, Decatur, Ga. (Jan. '38)

Webb, Leroy C., Supt. of Water, Gridley, Calif. (Oct. '37)

Webb, S. W., Dist. Mgr., Consumers Power Co., Cadillac, Mich. (Jan. '21)

Webster, Fred D., Pacific Coast Mgr., National Meter Co., 1048 Folsom St., San Francisco, Calif. (Oct. '37)

Weckwerth, H. F., Supt., Kaukauna Water Works, Kaukauna, Wis. (June '30)

Weed, Frederick H., Federal Power Com., Room 501, 1757 K St., N.W., Washington, D. C. (Nov. '25)

Weekes, Claude H., *see* Fresno City Water Dept.

Wehrfritz, Frank W., 204 Claremont Ave., Jersey City, N. J. (Jr. M. Jan. '40)

Weidlein, E. R., Mellon Institute of Industrial Research, 4400 Fifth Ave., Pittsburgh, Pa. (June '24)

Weidner Hayes, Supt. of Water & Sewers, 516 N. Leroux St., Flagstaff, Ariz. (July '32)

Weigand, Herman, Chemist Operator, Water Dept., 605 Walnut St., Leavenworth, Kan. (Jan. '40)

Weir, John J., Sales Mgr., The Lansdell Co., 95 Zabriskie St., Hackensack, N. J. (Affil. Jan. '39)

Weir, Paul, 1210 Hemphill Ave., N. W., Atlanta Water Works, Atlanta, Ga. (Dec. '29) *Fuller Award '40.*

Weir, W. H., State Board of Health, 138 State Capitol Bldg., Atlanta, Ga. (Dec. '24) *Director '35-'37.*

Weir, W. Victor, Supt., St. Louis County Water Co., 6600 Delmar Blvd., University City, Mo. (July '24) *Diven Medal '40.*

Weisse, F. W. E., Supt., Meter Dept., Central Power & Light Co., Corpus Christi, Tex. (Oct. '38) *Fuller Award '39.*

Welch, W. A., Industrial Chemical Sales Co., Widener Bldg., Philadelphia, Pa. (Jan. '36)

Weldon, Wm. B., Asst. Engr., 404 City Hall, Chicago, Ill. (July '38)

Well Machinery & Supply Co., Gordon B. Smith, 1629 Main St., Fort Worth, Tex. (Assoc. M. July '39)

Welland Board of Water Comrs., J. C. Street, Supt., Welland, Ont., Can. (Corp. M. May '20)

Wells, Sidney W., Chemist, Florida State Board of Health, Jacksonville, Fla. (Apr. '37)

Wells, W. Plummer, Chemist, Aberdeen Water Dept., 1402 N. Lincoln St., Aberdeen, S. D. (July '39)

Welsford, H. R., San. Engr., Pennsylvania State Dept. Health, 413 First National Bank Bldg., Greensburg, Pa. (Apr. '27)

Welter, Roy, Box 535, New Haven, Conn. (Jan. '39)

Wenrich, H. P., Engr., California Water Service Co., P. O. Box 1150, San Jose, Calif. (Oct. '38)

Wentworth, John P., Cons. Engr., Metcalf & Eddy, Cons. Engrs., 1300 Statler Bldg., Boston, Mass. (July '26)

Wentworth, William Edgar, San. Engr., P. O. Box 775, Vallejo, Calif. (Oct. '38)

Werth, C. W., Asst. Supt. of Filtration, Board of Water Comrs., 3363 W. Clyde Pl., Denver, Colo. (Jan. '36)

Wertz, C. F., 1522 Woolworth Bldg., New York, N. Y. (Mar. '24)

West, Chas. C., Gen. Mgr., Sayre Water Co., Sayre, Pa. (Dec. '22)

West Lafayette Water Works Co., E. K. Warren, Secy., 117 Vine St., West Lafayette, Ind. (Corp. M. Apr. '34)

West Palm Beach Water Co., R. W. Reynolds, Drawer B.-25, West Palm Beach, Fla. (Corp. M. Apr. 30) *Director '41–'42.*

West, Vernon F., Consumers Water Co., Box 151, Pearl St. Station, Portland, Me. (June '14)

West Virginia Public Service Com., Earle H. Morris, Chief Engr., State House, Charleston, W. Va. (Corp. M. Apr. '39)

"Western City Magazine," Winston R. Updegraff, 458 S. Spring St., Los Angeles, Calif. (Assoc. M. Sept. '29)

Western Pipe & Steel Co. of California, R. D. Plageman, Vice-Pres., 444 Market St., San Francisco, Calif. (Assoc. M. Aug. '24)

Weston, Arthur D., Chief Engr., Massachusetts Dept. of Public Health, 511A State House, Boston, Mass. (July '31)

Weston, Robert Spurr, Cons. San. Engr., 14 Beacon St., Boston, Mass. (June '98) *Honorary M. '30. Director '36–'38.*

Weston, Roy F., 3144 Passyunk Ave., Philadelphia, Pa. (July '37)

Weymouth, Alvin L., Comr. of Public Works, 309 Front St., Santa Cruz, Calif. (Jan. '37)

Wheatley, Walter, Comr. of Public Works, City Hall, Okmulgee, Okla. (Oct. '39)

Whedbee, Edgar, 4311 Hartford St., Dallas, Tex. (June '26)

Wheeler, Robert C., Barker & Wheeler, 36 State St., Albany, N. Y. (Oct. '14)

Whelchel, H. E., Supt., Water Works, College Park, Ga. (Nov. '30)

Whipple, Melville C., Asst. Prof. of San. Chemistry, Harvard Univ., 112 Pierce Hall, Cambridge, Mass. (May '22)

Whitaker, M. B., *see* Knoxville Elec. Power & Water Board

Whitby Public Utility Com., H. L. Pringle, Supt., Munic. Waterworks Dept., Whitby, Ont., Can. (Corp. M. Feb. '24)

Whitcomb, Leon R., San. Engr., 408 West Ave., Philadelphia, Pa. (Apr. '37)

White, George W., The Harwood Beebe Co., 208 Montgomery Bldg., Spartanburg, S. C. (Dec. '24)

White, Guy H., Supt. of Water Plant, 2217 Gadsden St., Columbia, S. C. (Nov. '25) *Fuller Award '38. Director '41–'43.*

White, Herbert L., San. Engr., Univ. of Illinois, 256 Administration Bldg., W., Urbana, Ill. (Jan. '32)

White, Homer C., Dept. of Water & Power, City of Los Angeles, Box 3669 Terminal Annex, Los Angeles, Calif. (Oct. '37)

White, John C., State Power Plant Engr., 624 E. Main St., Madison, Wis. (May '30)

White, L. R., Supt. Water Dept., Mount Vernon, Wash. (Apr. '40)

White Plains Dept. of Public Works, William I. Collyer, Water Supt., White Plains, N. Y. (Corp. M. (July '16)

White, Stewart H., Supt. of Utilities, 138 W. Front St., Port Angeles, Wash. (May '34)

White, Wm. Wallace, San. Engr., Nevada Public Health Service, 25 Fordonia Bldg., Reno Nev. (July '37)

Whiteley, Donald, Water Engr. & Mgr., Water Dept., 4 Lindun Rd., Lincoln, England (Feb. '31)

Whitley, F. H., Instructor in San. Eng., New York Univ., University Heights, N. Y. (Jan. '39)

Whitlock, C. B., Mgr., West Virginia Water Service Co., Madison, W. Va. (July '35)

Whitlock, Ernest W., Engr., % Malcolm Pirnie, 25 W. 43rd St., New York, N. Y. (May '30)

Whitman, Earl R., Draftsman, Dept. of Water & Power, Box 3669 Terminal Annex, Los Angeles, Calif. (Oct. '35)

Whitman, Ezra B., Whitman, Requardt & Smith, Engrs., West Biddle St. at Charles, Baltimore, Md. (Apr. '10)

Whittaker, H. A., Director, Div. of Sanitation, State Board of Health, Minneapolis, Minn. (June '13)

Whittier, City of, M. R. Bowen, City Water Supt., City Hall, Whittier, Calif. (Corp. M. Dec. '26)

Whittier, Frederick, The Barrett Co., Research Lab., Edgewater, N. J. (Jan. '39)

Wichita, City of, Alfred MacDonald, City Mgr., Wichita, Kan. (Corp. M. Jan. '40)

Wickham, R. B., Supt. of Power, Langdale, Ala. (July '38)

Widener, Will O., Dist. Engr., National Aluminate Corp., Flagler Hotel, Jacksonville, Fla. (July '40)

Wiedeman, H. F., Wiedeman & Singleton, Inc., P. O. Box 1878, Atlanta, Ga. (Mar. '25) *Director '32-'34.*

Wieghardt, George F., Hydr. Engr., 1337 Dickerson Rd., West Englewood, N. J. (Mar. '24)

Wiel, Kurt, City Engr., Miles City, Mont. (Feb. '34)

Wieters, A. H., Chief Engr., Div. of San. Eng. & Housing, State Dept. of Health, Des Moines, Iowa (Nov. '21)

Wiggin, Thos. H., Cons. Engr., 90 Broad St., New York, N. Y. (May '22) *Goodell Prize '40.*

Wight, Cecil Douglas, Asst. Water Works Engr., Transportation Bldg., Ottawa, Can. (Jan. '38)

Wightman, F. C., Town Mgr., Kentville, Nova Scotia (July '38)

Wilbur, C. C., 2760 Thomas Ave., S., Minneapolis, Minn. (Feb. '24)

Wilcox, William F., P. O. Box 698, Atlanta, Ga. (Sept. '93)

Wiley, Frank E., *see* Lawrence Water Dept.

Wiley, Ralph B., Head, School of Civ. Eng., Purdue Univ., Lafayette, Ind. (Apr. '34)

Wilkes, J. Fred., Chem. Engr., Dearborn Chemical Co., Apt. D-4, 55 Lafayette Drive, N.E., Atlanta, Ga. (Oct. '37)

Wilkins, Wm., Chief Operator, Montclair Water Bureau, 614 Bloomfield

Ave., Montclair, N. J. (Affil. Jan. '39)

Willard, Ernest C., Cons. Engr., 720 Corbett Bldg., Portland, Ore. (Oct. '14)

Willcomb, George E., San. Engr., 12 S. Lyons Ave., Albany, N. Y. (Apr. '22)

Williams, C. B., Supt., Water & Light, Lexington, N. C. (Jan. '36)

Williams, Chapple C., Chlorine Operator, Bureau of Water Works & Supply, Box 3669 Terminal Annex, Los Angeles, Calif. (Apr. '36)

Williams, Chas. H., City Engr. & Water Supt., 826 Percival St., Olympia, Wash. (July '34)

Williams, Chas. P., Resident Engr., Possum Kingdom Dam, P. O. Box 114, Mineral Wells, Tex. (Nov. '32)

Williams, Clyde E., Engr., 2180 Hollywood Pl., South Bend, Ind. (July '37)

Williams, D. McGregor, *see* Durham Water Dept.

Williams, Fred F., Supt., Board of Public Works, 119 S. Main St., Poplar Bluff, Mo. (Jan. '40)

Williams, George, Supt.-Treas., Honesdale Consolidated Water Co., Box 307, Honesdale, Pa. (July '36)

Williams, H. L., Pentwater, Mich. (Aug. '94)

Williams, L. L., City Mgr., Crystal City, Tex. (Oct. '39)

Williams, L. O., Jr., State San. Engr., State Dept. of Public Health, Cheyenne, Wyo. (Jan. '36)

Williams, Leon G., 2231 Glenwood Ave., Toledo, Ohio (July '28)

Williams, Macon M., Lenoir, N. C. (July '35)

Williams, R. O., Plant Supt., Lake Clinton, Foss, Okla. (Oct. '39)

Williams, Roy Campbell, Asst. Engr., 404 City Hall, Chicago, Ill. (Apr. '38)

Williams, Stanley N., Civ. Engr., 117 Grace St., Roselle, N. J. (July '36)

Williams, W. H., *see* Little Rock Munic. Water Works

Williamson, Cliff T., *see* Macon Board of Water Comrs.

Williamson, Edward, Supt., Downey County Water Dist., Downey, Calif. (Oct. '39)

Williamson, L. A., Div. Mgr., California Water & Telephone Co., P. O. Box I, National City, Calif. (July '38)

Williamson, R. C., Canadian Industries, Ltd., P. O. Box 1260, Montreal, Que., Can. (July '37)

Williamsport Water Co., 253 W. 4th St., Williamsport, Pa. (Corp. M. Apr. '07)

Willis, Frank T., C. C. M. O. Co., Water Plant, Box 68, McKittrick, Calif. (Sept. '29)

Willis, Willet R., Chemist & Bacteriologist, 1343 N. Navada Ave., Colorado Springs, Colo. (July '38)

Wills, W. Compton, Mgr. & Chief Engr., Water Dept., 16th & Market Sts., Wilmington, Del. (July '26)

Wilsey, E. P., *see* Hillsborough Water Dept

Wilson, Carl, 405 S. Hill St., Los Angeles, Calif. (June '28)

Wilson, E. J. F., Wiley & Wilson, Cons. Engrs., 908 Peoples National Bank Bldg., Lynchburg, Va. (Apr. '36)

Wilson, Edgar Kennard, Chief Engr., The Pitometer Co., 50 Church St., New York, N. Y. (Mar. '26)

Wilson, Guy L., Local Supt., Washington Water Power Co., Lewiston, Idaho (July '34)

Wilson, I. E., Water Comr., City Hall, Faribault, Minn. (Sept. '22)

Wilson, Murray A., Cons. Engr., Paulette & Wilson, Public Utility Bldg., Salina, Kan. (July '39)

Wilson, Percy S., 325 Washington St., Glen Ridge, N. J. (July '26)

Wilson, Thomas M., Sanitarian, County Health Dept., Goldendale, Wash. (Affil. Jan. '40)

Winder, Frank M., *see* Trenton Water Works

Winder, J. B., Supt., Dallas City Water Works, 112 City Hall, Dallas, Tex. (Oct. '35) *Director '37–'39.*

Winder, N. G., Dallas County Health Dept., 2801 Kings Rd., Dallas, Tex. (Oct. '39)

Windsor Utilities Com., The Chairman, Canada Bldg., Windsor, Ont., Can. (Corp. M. Apr. '31)

Winona Board of Munic. Works, H. C. Ahrens, Secy., Winona, Minn. (Corp. M. Dec. '22)

Winslow, C. E. A., Yale Medical School, New Haven, Conn. (Jan. '15)

Winslow, Edward L., Jr., 3802 Callaway Ave., Forest Park, Baltimore, Md. (Apr. '30)

Winslow, F. L., Secy. & Treas., Plainfield-Union Water Co., Plainfield, N. J. (July '35)

Winston, Herbert Owen, 1200 W. Elizabeth Ave., Linden, N. J. (Oct. '38)

Winterton, L. C., Cons. Engr., Pascagoula, Miss. (Apr. '38)

Wintgens, P. J., Supt., Ford City Water Dept., 1201—5th Ave., Ford City, Pa. (July '35)

Wirtz, George L., Secy., Atlas Mineral Products Co. of Pa. Mertztown, Pa. (Oct. '38)

Wise, Wm. H., Topographical Draftsman, Dept. of Water & Power, Box 3669 Terminal Annex, Los Angeles, Calif. (Apr. '38)

Wise, William R., 2003 Johnstone St., Newberry, S. C. (Jr. M. Apr. '38)

Witherington, Albert A., Filtration Plant Operator, St. Catherine Water Works Com., R. R. 1, Fonthill, Ont., Can. (Jan. '40)

Witty, T. E., Supt. of Plants, Thomasville, N. C. (July '40)

Wolbert, H. E., Supt., Board of Water Supply, Mount Vernon, N. Y. (May '16)

Wolcott, Herbert, 610 Range Line St., Columbia, Mo. (Jan. '39)

Wolfe, Edward E., Chemist, Water Dept., Hannibal, Mo. (Apr. '22)

Wolfe, James O., Supt., Water Dept., Concordia, Kan. (Jan. '40)

Wolfe, Thomas F., Research Engr., Cast Iron Pipe Research Assn., 309 Peoples Gas Bldg., Chicago, Ill. (Mar. '22)

Wolff, William R., Assoc. Valuation Engr., Public Service Com., 80 Centre St., New York, N. Y. (Mar. '30)

Wolman, Abel, Prof. of San. Eng., Johns Hopkins Univ., Baltimore, Md. (Mar. '18) *Editor '22–'37. Diven Medal '37. Director '40–'42.*

Woltman, J. J., Civ. Engr., 225 Unity Bldg., Bloomington, Ill. (May '23)

Womack J. W., Jr., Supt., Water Dept., McMinnville, Tenn. (Apr. '40)

Wood, A. Baldwin, Gen. Supt., Sewerage & Water Board of New Orleans, 526 Carondelet St., New Orleans, La. (Jan. '39)

Wood, C. Leland, Supt. of Munic. Com., 602 Church St., Herkimer, N. Y. (July '27)

Wood, George Pillsbury, Supt., Board of Water Com., Municipal Bldg., Peekskill, N. Y. (Jan. '31)

Wood, James, Eng. Inspector of Water Works, 215 Walnut St., Peekskill, N. Y. (Apr. '37)

Wood, Leonard P., Asst. Engr., Board of Water Supply, 346 Broadway, New York, N. Y. (Mar. '24) *Diven Medal '34.*

Wood, R. D., Co., Chas H. Becker, 400 Chestnut St., Philadelphia, Pa. (Assoc. M. Apr. '84)

Wood, Theodore V., R. D. Wood Co., 400 Chestnut St., Philadelphia, Pa. (Apr. '30)

Woodson, John T., General Sales Mgr., Lynchburg Foundry Co., Lynchburg, Va. (Jan. '39)

Wooten, Frank, Jr., Cons. Engr., 104 Latta Arcade, Charlotte, N. C. (Jan. '40)

Worthington-Gamon Meter Co., Harrison, N. J. (Assoc. M. May '20)

Worthington Pump & Machinery Corp. Thomas Cruthers, Vice-Pres., Harrison, N. J. (Assoc. M. June '01)

Wraight, Alan F. A., Asst. Chief Clerk, York Township Water Revenue Dept., 155 King St., E., Toronto, Ont., Can. (Apr. '39)

Wrench, Joseph, Sales Mgr., Industrial Chemical Sales Div., West Virginia Pulp & Paper Co., 230 Park Ave., New York, N. Y. (Jan. '37)

Wright, C. W., Pres., Badger Meter Mfg. Co., 2357-71 N. 30th St., Milwaukee, Wis. (Mar. '27)

Wright, Chilton A., Prof. of Hydr. & San. Eng., Polytechnic Institute of Brooklyn, 99 Livingston St., Brooklyn, N. Y. (Oct. '38)

Wright, Clarence W., Asst. Civ. Engr., Detroit Dept. of Water Supply, 15492 Woodingham Drive, Detroit, Mich. (Affil. July '39)

Wright, Geo. E., Cons. Engr., 52 Bissell Ave., Corning, N. Y. (July '38)

Wright, James, Supt., Dundas Water Works, Dundas, Ont., Can. (Apr. '24)

Wright, Le Roy H., Supt. of Water Works, City Hall, Newark, N. Y. (Apr. '27)

Wyant, Carl, Resident Engr., Montecito County Water Dist., 583 San Ysidro Rd., Santa Barbara, Calif. (Mar. '24)

Wyckoff, Charles R., 285 Riverside Drive, New York, N. Y. (Apr. '18)

Wyckoff, H. A., Prof. of Bacteriology, Georgia School of Technology, Atlanta, Ga. (Apr. '38)

Wyckoff, Wayne W., Asst. Civ. Engr., Box F., West Portal, Bishop, Calif. (Oct. '34)

Wylds, H. G., Supt. of Filtration, Augusta Water Works, 2771 Central Ave., Augusta, Ga. (Affil. Jan. '40)

Yaxley, R. Gordon, Supt. to Water Comrs., Waterford, N. Y. (Oct. '25)

Yegen, William, Supt. of Filtration Plant, 422—9th St., Bismarck, N. D. (June '27)

York, Township of, O. M. Falls, Comr. of Works, 40 Jarvis St., Toronto, Ont., Can. (Corp. M. July '32)

Young, C. H., Dist. Engr., Pennsylvania Dept. of Health, Trust Bldg., Meadville, Pa. (June '29)

Young, George Richmond, Village Mgr., Village Hall, Glencoe, Ill. (July '28)

Young, Joseph E., *see* Fergus Falls Water Dept.

Young, Oliver H., Supt., Kent City Water Works, 543 Fairchild Ave., Kent, Ohio (Jan. '39)

Young, S. R., Supt., City Water Dept., Hardin, Mont. (Jan. '40)

Young, T. L., Mgr., South Side Water Works Co., Chester, W. Va. (June '21)

Young, W. H., Supt. of Water Works, Ormond, Fla. (July '40)

Youngquist, R. Clifford, 1655 Angelus Ave., Los Angeles, Calif. (Jan. '38)

Youngstown Sheet & Tube Co., E. Harrison Thwaits, Cons. Engr., Water Works Div., Stambaugh Bldg., Youngstown, Ohio (Assoc. M. Jan. '37)

Yow, W. E., Supt., Water Dept., Asheboro, N. C. (Dec. '33)

Zanetti, Francisco E., Chemist & Bacteriologist, Havana Water Works, P. O. Box 1742, Havana, Cuba (Feb. '30)

Zapata, F. A., Repr., U. S. Pipe & Foundry Co., Apartado 99, Mexico, D. F., Mexico (July '38)

Zapf, Chas. F., *see* Ventura City Water System

Zapffe, Carl, Box 93, Brainerd, Minn. (July '35)

Zelley, John W., Watershed Inspector, New Jersey State Dept. of Health, Columbus Rd., Burlington, N. J. (Affil. Jan. '39)

Zentner, Egon, Chem. Engr., Research Dept., The Permutit Co., 330 W. 42nd St., New York, N. Y. (Apr. '40)

Zieber, Warren, American Tank Service Co., Ellinwood, Kan. (Apr. '40)

Zollner, F. D., Dist. San. Engr., State Health Dept., 35 State St., Batavia, N. Y. (Affil. Jan. '40)

Zufelt, Jerome C., Supt., City Water Dept., 418 St. Clair Ave., Sheboygan, Wis. (Oct. '31)

Zumwalt, J. V., Supt., Water & Light Dept., 317 S. 11th St., Frederick, Okla. (Oct. '39)

CORPORATE MEMBERS

See Consolidated List of Members for addresses and other data

Abercrombie, J. S., Co.
Adirondack, W. W.
Allendale, Boro W. Dept.
Allentown Bur. of W.
American W. W. & Elec. Co., Inc.
Ames W. Dept.
Anaconda Copper Mining Co.
Anderson, City of
Anheuser-Busch, Inc.
Ann Arbor W. Dept.
Argentina, Obras Sanitarias de la Nacion
Ashland W. Dept.
Auburn W. Dept.
Aurora W. & Light Com.
Austin Bd. of W., Elec., Gas & Power Com.

Baker Depts. of W., Fire & Sanitation
Balliston Spa W. Dept.
Barrie Pub. Util. Com.
Batavia Supt. of W.
Belle Glade W. W.
Belleville Pub. Util. Com.
Bellingham W. Dept.
Beverly Hills W. Dept.
Birmingham W. Co.
Bloomfield, Town of
Boone W. Dept.
Boulder W. Dept.
Bowling Green, City W. Co.
Bozeman Pub. Util. Com.
Brantford Pub. Util. Com.
Bristol (Tenn.), City of
Bristol (Va.), City of
Buffalo Div. of W.
Buffalo Niagara Elec. Corp.
Burbank Pub. Serv. Dept.

California Oregon Power Co.
California W. & Telephone Co.
Camden County Vocational School
Canon City W. Supt.
Canton Munic. Util.
Casper, City of
Cedar Rapids, City W. W.
Central Power & Light Co.
Charleston Com. of Pub. Works
Chatham Bd. of W.
Chillicothe W. Co.
Citizens Util. Co.
Citizens W. Supply Co. of Newtown
Community W. Serv. Co.
Corpus Christi, City of
Crown Point W. Dept.
Cuba, Cia de Acueducto, S. A.
Cullman, City Light & W. Plant

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Delphi W. W.
Deming W. Dept.
Denver, City & County of
Deseronto Pub. Util. Com.
Des Moines W. W.
District of Columbia W. Dept.
Dover W. Com.
Du Dois Bur. of W.
Dunkirk Bd. of W. Com.
Dunnville Pub. Util. Com.
Durham W. Dept.

East Aurora, Village of
East Bay Munic. Util. Dist.
East Chicago Dept. of W. W.
East Helena, City of
East Orange Bd. of W. Com.
East York, Township of
Ebasco Services, Inc.
Ecusta Paper Corp.
Edmonton, City of
El Paso W. Dept.
Elkhorn Light & W. Com.
Elmira W. Bd.
Emporium W. Co.
Endicott W. W. Co.
Eugene W. Bd.
Evansville Dept. of W. W.
Everett W. Dept.

Federal Advisers, Inc.
Fergus Falls W. Dept.
Fire Underwriters Inspection Bur.
Fishers Island Farms, Inc.
Flint W. Dept.
Fond du Lac, City W. Dept.
Fort Collins, City of
Fresno City W. Dept.

Gananoque W. W. Com.
Garden City, Inc. Village of
General Utilities Co., Ltd.
Glen Ridge W. Dept.

Glendale Pub. Serv. Dept.
Glens Falls Bd. of W. Com.
Göteborgs Vattenledningsverk
Grand Rapids W. Dept.
Great Falls, City of
Greeley, City of
Green Bay W. Dept.
Griffin Light, W. & Sewerage Dept.
Guatemala, Compania del Agua del Mariscal, S. A.
Guelph, City Engr.

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Hälsingborg, City W. Dept.
Harlan Munic. W. W.
Hastings Bd. of Pub. Works
Hawaiian Pineapple Co., Ltd.
Healdsburg, City of
Helena, City of
Hempstead, Inc. Village of
Hibbing W., Light, Power & Bldg. Com.
Hickory, City of
Hicksville W. Dist.
Hillsborough W. Dept.
Hillside Distribution Co.
Holland W. Dist. No. 1
Hollister W. Co.
Honolulu Bd. of W. Supply
Hot Springs W. Co.
Houston W. Dept.
Hudson Dept. of Pub. Works

Idaho Surveying & Rating Bureau
Idaho, University of
Ilion Bd. of W. Com.
Illinois Inspection Bur.
Indiana State Bd. of Health
Indianapolis Dept. of Conservation
Inglewood W. Dept.

Jamestown Bd. of Pub. Util.
Jasper Light & W. Dept.
Jerome W. Co.
Johnson City W. Dept.

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Kapuskasing, Corp. of Town of
Kenosha W. Dept.
Kentucky Bur. of San. Eng.
Kentucky Util. Co.
Kitchener W. Com.
Knoxville Elec. Power & W. Bd.

Lafayette W. W.
Laguna Beach Co. W. Dist.
Lake Forest W. Dept.
La Mesa, Lemon Grove & Spring Valley Irrigation Dist.
Lansing Bd. of W. & Elec. Light Com.
LaPorte W. W.
Lawrence, City W. Dept.
Lincoln, City W. & Light Dept.
Little Rock Munic. W. W.
Livingston W. Dept.
Lompoc Light & W. Dept.
London Pub. Util. Com.
Long Beach W. Com.
Los Angeles Dept. of W. & Power
Louisville W. Co.
Loveland, City of

Macon Bd. of W. Com.
Madison Suburban Util. Dist.
Malmö Byggnadskontor
Manila Metropolitan W. Dist.
Mason City W. Dept.
Maybrook W. Bd.
McMinnville W. & Light Dept.
Medford W. Com.
Melbourne & Metropolitan Bd. of Works
Memphis Bd. of Light & W. Com.
Merritton Pub. Util. Com.
Mexico, Banco Nacional Hipotecario Urbano y de Obras Publicas, S. A.
Miami Munic. W. Supply
Middletown W. Dept.
Midland (Mich.) W. Dept.
Midland (Ont.) Pub. Util. Com.
Milford W. Co.
Millville W. Co.
Mineral Wells, City W. W.
Minneapolis Com. of W. W.
Mishawaka, City W. & Elec. Plant
Moline W. W.
Monroe Avenue W. Dist.
Montgomery Bd. of W. Com.
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Mount Holly W. Co.
Mt. Morris W. Dept.
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Multnomah, Home W. Dist.
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Nassau County Dept. of Health
National Lead Co.
Neenah City W. W.
Nehi Corp.
New Jersey State W. Policy Com.
New Jersey W. Co.
New Mexico Power Co.
New Mexico Power Co. (Agua Pura Div.)
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North Bay, City of
North Creek, W. Dist.
North Jersey Dist. W. Supply Com.
North York, Township of

Northeastern W. & Elec. Serv. Corp.
Northern Indiana Pub. Serv. Co.

Ocala W. Dept.
Oconomowoc W. Dept.
Oil City Bur. of W.
Olean Bd. of W. Com.
Omaha Metropolitan Util. Dist.
Orillia W., Light & Power Com.
Oshawa Pub. Util. Com.
Oswego Dept. of W.
Ottawa, City of
Owego W. W.

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Palm Springs W. Co.
Parker Lab.
Pasadena W. Dept.
Pennichuck W. W.
Peterborough Util. Com.
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Pittsburg Munic. Power Co.
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Portland Cement Assn.
Portland Bur. of W. W.
Poughkeepsie Bd. of Pub. Works
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Pub. Service Co. of Indiana
Purity Springs W. Co.

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Regina W. W. Dept.
Richfield Springs W. Com.
Riverside W. Dept.
Rome Bur. of W.
Rubio Canon Land & W. Assn.

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St. Paul Bd. of W. Com.
St. Thomas Pub. Util. Com.
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Salem (Ore.) W. Com.
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Salt Lake City Corp. W. Dept.
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San Bernardino Bd. of W. Com.
San Diego W. Dept.
San Fernando W. Dept.
San Francisco W. Dept.
San Jose W. W.
Santa Ana Valley Irrigation Co.
Santa Ana W. Dept.
Santa Barbara, City of
Santa Monica, City of
Scarborough Pub. Util. Com.
Schenectady, City of
Scranton-Spring Brook W. Serv. Co.
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Seattle W. Dept.
Seneca Falls W. Dept.
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Sheboygan Bd. of W. Com.
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Springfield, City W., Light & Power
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Strathroy Pub. Util. Com.
Syracuse Dept. of Eng.

Teck, Township of
Tennessee Eastman Corp.
Texas Tech. College Library
Tilbury Pub. Util. Com.
Timmins, Corp. Town of
Toronto Dept. of Works
Trenton W. W.
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Tulsa W. Dept.
Tuscaloosa, City of
Two Harbors, City of

Utrechtsche Waterleiding-
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Windsor Util. Com.
Winona Bd. of Munic. Works

York, Township of

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Art Concrete Works
Atlas Mineral Products Co. of Pa.
Atlas Powder Co.

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Bird-Archer Co., Ltd.
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Gorman-Rupp Co.
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Greenberg's, M., Sons
Griffin Chem. Co.
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Mueller Co.
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Nutting, H. C., Testing Engrs.

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Ozark Chem. Co.
Ozone Processes, Inc.

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Pitometer Co.
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Water Works Engineering
Water Works Supply Co.
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Western City Magazine
Western Pipe & Steel Co. of Calif.
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Worthington Pump & Machinery Corp.

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Youngquist

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Fort Pierce: Gahn

Gainesville: Black

Jacksonville: Broughman, Catlett, Gray, Helwick, Herring, Hoy, McCall, McClane, Murray, Newman, Richheimer, Ruge, Saine, St. John, Smith, Tyler, Wakefield, Ward, Weaver, Wells, Widener

Melbourne: Stickel

Miami: Cross, Culter, DeWolf, Henry, Hyman, Lambert, Munic. W. Supply, Sydow

Ocala: Dixie Lime Products Co., Meffert, City of Ocala W. Dept., Wallace

Orlando: Clapp, Cousins, Croll, Michaels, Norris, Orlando Pub. Util. Com.

Ormond: Young

Pensacola: Semmes

St. Augustine: Center, Johnson, Johnston

St. Petersburg: Lee, Oberly, Ridgely

Sarasota: Dodd

Tallahassee: Cotton, Gunter

Tampa: Hamilton, Langston, Long, Lyles, Merriman, Purity Springs W. Co.

West Palm Beach: Chinn, Conk, Tanner, West Palm Beach W. Co.

Winter Haven: Colyer

GEORGIA

Athens: Beacham

Atlanta: Avrett, Cady, Clarkson, De Jarnette, Frith, Hall, Hansell, Henley, Hicklin, Houston, Kahn, Patton, Rapp, Reynolds, Shuff, Sledge, S. H. Smith, T. E. Smith, Stollard, Taulman, Thompson, Walker, P. Weir, W. H. Weir, Wiedeman, Wilcox, Wilkes, Wyckoff

Augusta: Cooper, Wylds

Brunswick: Anderton, Killian, Robinson

Cairo: Clifford

Canton: Groves

Cartersville: Dent

College Park: Whelchel

Columbus: Hull, Lowe, Nehi Corp., Smalshaf

Dalton: Jones

Decatur: Weaver

Dublin: Roberts

East Point: Sparks

Elberton: Wallis

Griffin: Griffin Light, W. & Sewerage Dept.

La Grange: Sargent

Lindale: Turley

Macon: Macon Bd. of W. Com., Matthews, Slocum

Marietta: Du Pre

Moultrie: McLean

Newnan: Jacobs, Passolt, Perryman

Rome: Alexander, Angle, Hamler

Savannah: East

Swainsboro: Lenert

Thomaston: George

Thomasville: Dawes, Mathews

Valdosta: Dunbar

Waynesboro: Mills

IDAHO

Boise: Idaho Surveying & Rating Bureau, Jackson, Leonard

Bonners Ferry: Buroker

Jerome: Jerome W. Co.

Lewiston: Berkeley, Hughes, Wilson

Moscow: Early, Univ. of Idaho

Orofino: Hallam

Pocatello: Rainey

Wallace: Citizens Util. Co.

ILLINOIS

Alton: Crum, Mississippi Lime Co.

Aurora: Sperry

Bloomington: Stutz, Woltman

Blue Island: Bender

Brookfield: Kulin, Pinner

Cairo: Hileman

Carbondale: Fore

Champaign: Amsbary, Reinhardt

Chicago: Abplanalp, Allen, Alvord, American Colloid Co., American Concrete Pipe Assn., Anderson
Bardwell, Barksdale, Barron, Baylis, Behrman, Birch Mfg. Co., Bird, Bird-Archer Co., Birdsall, Birkeness, C. N. Brown, J. R. Brown, Brune, Burdick
Chamberlain, Chicago Bridge & Iron Co., Chicago Pump Co., James B. Clow & Sons, Connolly, Consoer, Coughlan, Crane Co., Cullen
Dallach, DeBerard, De Leuw
Eliassen, Engel, Everson Mfg. Co.
Fager, Fishtein, Fulkman
Gayton, General Chem. Co., Gerstein, Goldsmith, Gordon, Gorman, Greeley, Groner
Haering, Hansen, Harris, Hartmann, Hendricks, Herring, Hill, Holmes, Horstmann, Hudson, Hughart
Illinois Inspection Bur., International Filter Co.
Jewell, D. W. Johnson, S. C. Johnson, Judge
Knowles, Kuehn
Lansford
Mabbs Hydraulic Packing Co., Maxwell, McClenahan, McElhiney, Meites, Mitchell, Mohlman, Munn
National Aluminate Corp., Noble
Ockershausen
Parlett, Pearse, Phelps, Portland Cement Assn.
Quigley
Randiett, Rankin, Reece, Reilly, Revelle, Reynolds, Riedel, Robinson
Schmid, F. R. Shaw, W. A. Shaw, Sherwood, Slee, Snow, Stannard Power Equipment Co., Sybrandt
Tatnall, Thayer, Towns
Waller, W. W. & Sewerage, Weldon, Williams, Wolfe

Cicero: Broz

Danville: Ely, Symons

Decatur: Greenfield, Hatfield, Mueller Co., Nalefski, Van Praag, Warren

Des Plaines: Lucey

Dixon: Coe

East St. Louis: Horner, Roos

Edwardsville: Case, Harris

Elgin: Lloyd, Scarritt, Trentlage

Evanston: Frye, Polk

Freeport: Hutchins

Geneva: Hellstrom

Glencoe: Pflanz, Young

Highland: Thomas

Highland Park: Hardin, Prindle

Hinsdale: Howson, Martin

Jacksonville: Caldwell, Stoldt

Kankakee: Minor

Kenilworth: Ruston

La Grange: Krause

Lake Forest: Lake Forest W. Dept.

Lincoln: Rimbach

Manteno: Leland

Mattoon: H. W. Clark Co., Coventry, Goetz

Moline: Moline W. W.

Murphysboro: Bigelow

Northbrook: Culligan Zeolite Co.

Oak Park: Davidson, Dutton

Pana: Stanfield

Pekin: Lautz

Peoria: Morrow, Walker

Pontiac: Murphy

Quincy: Gelston, W. W. Com.

Rockford: Merz

Salem: Denton

Springfield: Anderson, Black, Bonn, City W. Light & Power, Clark, Downer, Klassen, Spafford, Spaulding, Tolburg

Sterling: Kingman, MacDonald

Streator: Adams

Urbana: Babbitt, Buswell, Enger, Fleming, Gerber, Gobble, Larson, Pickels, Suter, Talbot, White

Waukegan: Kallis

Western Springs: Burns, Simantel

Wilmette: Miceli, Olson

Winnetka: French

INDIANA

Alexandria: Burden

Anderson: City of Anderson

Batesville: Schwier

Bedford: Norman

Bloomington: Crafton, Jackson

Butlerville: Schoolcraft

Crawfordsville: Mitchell, Straetz

Crown Point: City of Crown Point W. Dept.

Decatur: Brodbeck

Delphi: Delphi W. W.

East Chicago: Dept. of W. W.

Elkhart: Clark, Link

Elwood: Barnes

Evansville: Evansville Dept. of W. W., Geupel, Stilwell

Fort Wayne: Baals, Hoot, Mathews

Frankfort: Stern

Franklin: Foist

Gary: Mathews, Sandbach

Greencastle: Stewart

Hammond: Besozzi, Colby, Northern Ind. Pub. Serv. Co., Vaughn

Huntingburg: Grewe, Lewis

Huntington: Shultz

Indianapolis: Blank, Boggs
Calvert, Carroll, Carter, Coughlen
Dept. of Conservation
Finch, Frame
Garman, George
Heider, Horstman, Hurd
Ind. State Bd. of Health
Jeup, Jordan
Kershaw, Kinney, Kirkpatrick, Kleiser
Leonard
Mabee, Matthews, Mauch, Merrick, Miller, Moore, Morse
Nickel, Niemeyer
Perrine, Poole, Pub. Serv. Co. of Ind.
Reed, Reilly Tar & Chem. Corp., Richetta, Rupard
Schwier, Swingley
Universal Gear Corp.

Jasonville: Oeffler

Jasper: Jasper Light & W. Dept.

Kendallville: Ludlow

Kokomo: Stradling

Lafayette: Layayette W. W., Wiley

La Grange: Smith

LaPorte: LaPorte W. W.

Lawrenceburg: A. D. Cook Inc.

Lebanon: Ridgway

Linton: Bull

Marion: Reardon

Markle: Boulware

Michigan City: Coote, Draves

Mishawaka: City W. & Elec. Plant, Gunderson

Mooresville: Steel Protection & Chem. Co. Inc.

Muncie: Self, Stewart

New Albany: Adams, Schaefer

Newcastle: Scholl

Peru: Hendrix

Plymouth: Crow

Portland: Emerson

Princeton: Porter, Princeton W. & Lighting Co.

Richmond: Dill, Shoemaker

Rochester: Gordon

Rockport: Huffman

Rushville: Caldwell

Salem: Languell

Scottsburg: Robbins

Shelbyville: Gutting

South Bend: Cain, Cole, Williams

Speed: Walker

Tell City: Gittings

Terre Haute: Durbin

Valparaiso: Bradley

Vincennes: Frew, Schwartz

Wabash: Evans, J. L. Ford, W. E. Ford

Washington: Gutsch

West Lafayette: Howland, West Lafayette W. W. Co.

West Terre Haute: Boling

Whiting: Bartuska

Worthington: Bailey

IOWA

Ames: Ames W. Dept., Galligan, Lawlor, Levine

Boone: W. Dept.

Burlington: Driftmier, Thompson

Cedar Rapids: Blomquist, City W. W., Meaney

Centerville: Alexander

Clinton: Meeker

Council Bluffs: Bailey, Finerty, Haas, Jensen, Nelson, Storm

Creston: Olsen

Des Moines: Des Moines W. W., Iowa Valve Co., D. L. Maffitt, H. C. Maffitt, Senges, Tenny, Wieters

Dubuque: Hail, A. Y. McDonald Mfg. Co.

Elkader: Schneider

Fort Dodge: Pray

Glenwood: Evrard

Iowa City: Bartow, Dawson, Hinman, Hostetler, Keller, Olin, Waterman

Laurens: Garner

Marion: Toms

Marshalltown: Pedersen

Mason City: Mason City W. Dept.

Muscatine: Molis, Muscatine City W. W., Stanley, Thorson

Oskaloosa: Hovey

Ottumwa: Brown, Elliott

Perry: Cole

Sioux City: Marzec, Nelson, Sutherland

Waterloo: Trueblood

KANSAS

Atchison: Weatherford

Concordia: Wolfe

Ellinwood: Zieber

Fort Leavenworth: Mortensen

Iola: Klaumann

Junction City: Rathert

Kansas City: Mangun

Lawrence: Boyce, City W. Dept., Cook, Haney

Leavenworth: Johnson, Kansteiner, Weigand

Manhattan: Ulrich

Salina: Badley, Hopkins, Salina W. Dept., Wilson

Topeka: Huffman, Paulette, Pelton, Rupp, Staley

Wichita: Millar, City of Wichita

Yates Center: Sieker

KENTUCKY

Ashland: Brownstead

Bowling Green: Hargett, Moorman

Carlisle: Clay

Catlettsburg: Cramer

Covington: Entwhistle, Kingsley

Danville: Terrell

Glasgow: Beatty

Harlan: Harlan Munic. W. W.

Harrodsburg: Johnson

Lexington: Cramer, Jacobson, Jernigan, Ky. Util. Co., Latham, Rosenbach, Watkins

Louisville: Bureau of San. Eng., Cantrell, Davidson, Franz, Gallagher, Harris, Hopkin, King, Louisville W. Co., Lovejoy, McGonigale, Overstreet, Peabody, Stover, Vance, Vogt Mfg. Co.

Madisonville: Branson, McCoy, Pritchett, Vannoy

Owensboro: Smith, Thornton

Paducah: Mitchell, Paducah W. W.

Richmond: Dougherty, Forbes

Russellville: Simmons

Winchester: Attersall

LOUISIANA

Baton Rouge: Connell

Bossier City: O'Donnell

Colfax: Watson

Harvey: Feitel

Monroe: Brothers, Cole

New Orleans: Earhart, Earl, Fowler, Gaspard, Grant, Guillot, Haas, Klorer, Moffat, O'Neill, Paterson, Wood

Ruston: Brooks

Shreveport: Amiss, Davis, Newland

Thibodaux: Thibodeaux

University: Schwartz

West Monroe: Brownlee

MAINE

Auburn: Cook

Augusta: Anthony, Campbell, Potter

Bangor: Patch, Powell, Read

Northeast Harbor: Burr

Portland: Coburn, Fuller, West

Rockland: McAlary

Sanford: Clark

Skowhegan: Patterson

York Village: Lucas

MARYLAND

Annapolis: Donaldson, Munroe

Baltimore: Activated Alum Corp., Blohm, Coates, Flack, Geyer, Green, Hall, Holland, Hopkins, Levy, Powell, Regester, Requardt, Small, Strohmeyer, Stuart, Whitman, Winslow, Wolman

Fort Meade: Millard, Tawney

Hyattsville: Devilbiss, Hall, Hechmer, Joyce, Shaw, Washington Suburban San. Com.

Luke: Patrick

Middle River: Cornell

Riverdale: Owings

Salisbury: Gardner

Silver Springs: Jester

Takoma Park: Griffin

MASSACHUSETTS

Acushnet: Sorelle

Andover: Tate Pipelinings Inc.

Belmont: Conroy

Beverly: Tarlton

Boston: Barbour, Bond
Chase, Clark
Eddy, Ellis, Ellsworth
Fales, French
Halpin, Horne, Hydraulic Development Corp.
Kennison, Killam
Marston
Pratt
Red Hed Mfg. Co.
Shaw, Skinner, Snow, Sweeney
Wentworth, A. D. Weston, R. S. Weston

Brookline: Houser

Cambridge: Camp, Fair, Good, Moore, Whipple

Concord: Robinson

Danvers: Esty

Fairhaven: Gidley

Foxboro: Foxboro Co.

Framingham: Reed

Gloucester: Moran

Greenbush: Lumbert

Greenfield: Field

Harwich: Swett

Haverhill: Driscoll

Holyoke: Tighe

Indian Orchard: Chapman Valve Mfg. Co.

Leominster: Classon

Lowell: Reynolds, Runels, Safford

Medford: Dwyer

Methuen: Mahoney

Milford: Milford W. Co.

Newton: Murray

Newtonville: Kinsel

North Andover: Duffy

Peabody: Quirk

Reading: Taber

Sandwich: Chase, Horton

South Boston: Edson Corp., Hersey Mfg. Co.

South Dartmouth: Taylor

Southbridge: Abbott

Springfield: Lochridge

Wakefield: Lead Lined Iron Pipe Co.

Wellesley: Adams

Winthrop: Howard

Worcester: Goodale, Hoy, Lingley

MICHIGAN

Adrian: Snedeker

Almont: Fenkell

Ann Arbor: Ann Arbor W. Dept., Ayres, Decker, Hoad, McEntee, McNamee

Bay City: Harrison

Benton Harbor: Russell

Birmingham: Egbert

Cadillac: Webb

Cass City: Brown

Coldwater: McQueen

Dearborn: Cooper, Courtney, Frey, La Marre, McCarthy, Michael, Mullen, Parks, Payne, Perry, Townsend

Detroit: Beatty, Burnett, Burroughs Adding Machine Co.
Dalee, Dempster, Dow, Dubois, Dunham
Feben
Garrity, Gerardy, Getz, Gould, Green, Grobbel
Hirn, Hornshaw, Hulbert
Lampman, Leisen, Lenhardt
McCormack, McGrath, Moffat, Morrill
Ouellette, Outzen
Perkins, Picard, Powers
Rasmussen, Rausch, Rudd
Saunders, Schoeninger, H. F. Smith, W. E. Smith
Wallace, Wright

Durand: Reynolds

East Lansing: Mallmann

Escanaba: Shank

Flint: Flint W. Dept.

Grand Rapids: Grand Rapids W. Dept., Mace

Grosse Pointe Farms: De Boer, Smith

Highland Park: Dahljelm, Golden

Hillsdale: Clark

Iron Mountain: Rubbo

Kalamazoo: Bender, Libby, Norman, Norton

Lansing: Erickson, Faust, Bd. of W. & Elec. Com., McGuire, Pirie, Rich

Ludington: Smith

Marquette: Cliffs Dow Chem. Co., Rowley

Marysville: Galloway

Melvindale: MacDonald

Midland: Midland W. Dept.

Monroe: Neis

Mt. Clemens: Keils

Muskegon: Sensabaugh

Niles: Crabill

Pentwater: Williams

Pontiac: Monroe

Port Huron: Mueller Brass Co.

Royal Oak: Landgraf

Saginaw: Eckert, Francis, Richardson

St. Clair: Baumann

Traverse City: Traverse City Iron Works

Wyandotte: Allen, Potts, Ward

MINNESOTA

Aurora: W. & Light Com.

Austin: Bd. of W. Elec. Gas & Power Com.

Brainerd: Zapffe

Cloquet: Campbell, Noreus

Duluth: Foster, Seligman

East Grand Forks: Powers

Ely: Buccowich

Eveleth: Stauff

Fairmont: Basom

Faribault: Wilson

Fergus Falls: W. Dept.

Grand Rapids: Hanson

Hibbing: Forsberg, W. Light Power & Bldg. Com., Mattson

Little Falls: McPherson

Mankato: Kircher

Minneapolis: Beal, Bell, Bromschwig, Brownell, Cordt, Estabrook, Finch, Fire Underwriters Inspection Bur., Janzig, Jensen, Johnson, Lundell, Lundquist, Mellen, Minneapolis Com. of W. W., National Soap & Chem. Co., Poole, Raab, Robbins, Rogers, Seemann, Smith, Sowden, Stock, Thompsen, Whittaker, Wilbur

Ortonville: Kriesel

Rochester: Schwarz

St. Cloud: Seibert

St. Paul: Bd. of W. Com., Cropsey, Druar, Findlan, Flanagan, Grime, Grodin, Edward E. Johnson Inc., Lucas, Morris, Mueller, Rosen, Shepard, Thompson, Thuma, Waterous Co.

Staples: Klang

Stillwater: Grove

Two Harbors: City of Two Harbors

Winona: Bd. of Munic. Works

MISSISSIPPI

Amory: Miller

Canton: Canton Munic. Util.

Greenwood: Stot

Jackson: Fewell, Kroeze, Ledbetter

Meridian: Pinkston

Natchez: Stewart

Pascagoula: Winterton

State College: Adams, Richey

Vicksburg: Tvargosky

Willows: Harding

MISSOURI

Boonville: Hagar, Sanders

Bowling Green: Dougherty

Carthage: Hoen

Chesterfield: Graf

Chillicothe: Higgins

Columbia: Logan, Luebbers, Wolcott

Hannibal: Watson, Wolfe

Harrisonville: Brown

Independence: Cottingham, Gallagher, Propst

Jefferson City: Helmreich, Johnson, Kramer

Joplin: Schanze

Kansas City: Abner Hood Chem. Co., Archer, E. W. Bacharach & Co., Baldwin, Barada & Page Inc., Barrett, Black, Collar, Crocker, Director of W. Dept., Filby, Foreman, Gilkison, Harper, Haskins, Joslyn, King, Lawrence, Learned, Lemert, McDonnell, McFarland, Mullergren, Omega Machine Co., L. C. Pensinger & Son, Ramey, Reynolds, Samuel, Smith, Strang, Timanus, Veatch

Liberty: Barnes

Maryville: Myers

Poplar Bluff: Lamar, Williams

St. Charles: Oelkans

St. Joseph: Juengst, McAndrew, Smouse

St. Louis: Allgeyer, American Foundry & Mfg. Co., Anheuser-Busch Inc., Dahm, Dean, Easterday, Hartung, Hawken, Henning, Holaday, Horton, Jutz, Kriz, Lischer, Meyer, Monsanto Chem. Co., Orth, Pritchard, Skinker, Wachter, Wall

Sedalia: Reed

Springfield: Everett, Piner

Trenton: Ralls

University City: Weir

Warrensburg: Christopher

MONTANA

Anaconda: Anaconda Copper Mining Co.

Big Timber: Walvoord

Billings: Beiswanger, Downs, Heath, Hewett

Bozeman: City of Bozeman, Cobleigh, Hurdle

Butte: Carroll, Hazen, Plummer, Sandquist

Chinook: Brandis

Deer Lodge: Gerstacker

Dillon: Bayerd

East Helena: City of East Helena

Forsyth: Palmer

Fort Shaw: Hall

Gardiner: Lauer

Glendive: Eyer

Great Falls: City of Great Falls, Evans, Shanley, Thomas, Voden

Hardin: Young

Havre: Atkinson

Helena: Champa, City of Helena, Eby, Foote, Mills, Miracle

Lewistown: Schmit

Livingston: Cortese

Miles City: Lindeberg, Wiel

Missoula: Christensen, Thane

Roundup: Quinnell

Three Forks: Merrill

NEBRASKA

Fremont: Henry

Hastings: Bd. of Pub. Works

Kearney: Bowker

Lincoln: City W. & Light Dept., Dunmire, Erickson, Filipi

McCook: Ray

Omaha: Barber, Bunnell, Byrne, Detweiler, Lasell, Metropolitan Util. Dist., Paxton-Mitchell Co., Refinite Corp.

Plattsmouth: Pollock

Sidney: Jones

York: Malster

NEVADA

Reno: Sierra Pacific Power Co., White

Virginia City: Leonard

NEW HAMPSHIRE

Concord: Howard

Manchester: Shaw

Nashua: Pennichuck W. W.

NEW JERSEY

Allendale: W. Dept. of Boro of Allendale

Alpha: Sheninger

Ampere: Brainard, Lock Joint Pipe Co., Longley

Atlantic City: Brunstein, Van Gilder

Bayonne: Conwell

Belleville: Fleming, Mowry

Beverly: Horan

Bloomfield: Town of Bloomfield

Bogota: Brinkerhoff

Boonton: Mallalieu, Mara

Bound Brook: Brush, Kupper

Brielle: Voorhees

Burlington: Conard, Hoffer, Johnson, Russel, Stokes, Zelley

Camden: Bowman, Lewis, Long, Rodan, Sleeper

Chatham: Smith, Van Wert

Clayton: Hungerford

Collingswood: Borden, Collings

Dover: Dover W. Com.

East Orange: Apgar, Bd. of W. Com., Cadmus, Godet, Halpin, Klein, N. J. State W. Policy Com., O'Brien, Roper, A. P. Smith Mfg. Co.

Edgewater: Whittier

Elizabeth: Biddle, Buck, Collins, Crane, McGrath, Newkirk, Radcliffe, Schaefer, Stone .

Essex Fells: Bell

Fairlawn: Harley, Knapp

Florence: Green

Florham Park: Scorso

Franklin: Jenkins

Freehold: McGowan, Schiverea

Glen Ridge: Flentje, Glen Ridge W. Dept., Wilson

Hackensack: Weir

Haddon Heights: N. J. W. Co., Stuart

Haddonfield: Borough W. Dept. Ford Meter Box Co.

Haledon: Miller

Hammonton: Adams, Lobley, Rehmann

Harrison: Fishwick, Hall, Matte, Worthington-Gamon Meter Co., Worthington Pump & Machinery Corp.

Hawthorne: Carmichael

Highland Park: Smalley

Jersey City: Jewell, Ohland, Sherman, Wehrfritz

Linden: Winston

Little Falls: Currens, Ogden

Livingston: Burack, Livingston W. Dept.

Long Branch: Herr

Manasquan: Van Brunt

Manville: Kachorsky, Krassy

Maplewood: Faulks

Medford: Wagner

Merchantville: Camden County Vocational School, Campbell, South Jersey Assn. of W. Supts.

Midland Park: Travis

Millville: Melvin, Millville W. Co.

Montclair: Bevan, Bourgin, Giannetti, Henderson, Knox, Stager, Weaver, Wilkins

Montvale: Gray

Moorestown: Greenwood, Hyland

Mount Holly: Mount Holly W. Co.

Mountain View: Deliso

New Brunswick: Atkinson, End, Lendall, Rudolfs

New Milford: Cowles, Spalding, Tamer

Newark: Andrews, Arenander, Banks, Browning, Childs, Costello, Eastwood, Faulks, Flanders, Garratt, Gibbons, Halpin, Hobby, Hutton, Merckel, Orchard, D. S. Plumb Co. Inc., Pratt, Robbins, Runyon, Schwartz, Tygert, Wallace & Tiernan Co. Inc.

Ocean City: Steelman

Orange: McNamara

Palmyra: Greco, Reinicker

Park Ridge: Smith

Passaic: Ryle

Paterson: Bonyun, Cook, Frazza

Perth Amboy: Booz, Cornelison, Reager

Phillipsburg: Thomas

Plainfield: Gavett, Winslow

Pompton Plains: Griffin

Princeton: Hutchinson, Riker

Rahway: Eller

Ramsey: Ramsey W. W.

Raritan: Miller

Red Bank: Cadman, Hotchkiss, Norcom

Ridgewood: Carr, Florence, Hartum, Holmes

Rochelle Park: Every

Roselle: Williams

Salem: W. Dept.

Sea Girt: Cornelius

South Amboy: National Lead Co.

South Orange: Smith

Sparta: Callahan

Summit: Bassett

Toms River: Snyder

Trenton: Brooks, Bugbee, Critchlow, Croft, De Laval Steam Turbine Co., Hanks, Johnson, Kroschwitz, Reid, Trenton W. W.

Upper Montclair: Baker, Ross

Verona: Graham

Wanaque: McCarthy, No. Jersey Dist. W. Supply Co., Purcell

Weehawken: Alfke, Cady, Fricker, Schlicht, Schwartz, Talbot

West Englewood: Wieghardt

West New York: Menzenhauer

West Orange: Capen, Fritz, Glannan

Westfield: Bushnell, Haskew, Wailes Dove-Hermiston Corp.

Woodbridge: Mundy

NEW MEXICO

Albuquerque: Haynes

Cimarron: Alpers

Deming: Deming W. Dept.

Las Vegas: N. M. Power Co. (Agua Pura Div.)

Raton: Riddell

Santa Fe: Fox, N. M. Power Co.

NEW YORK

Albany: Barker, Cox, Davis, Erickson, Gilcreas, Holmquist, Smith, Suter, Tracy, Wheeler, Willcomb

Amsterdam: Eaton, Taggart

Ashokan: Friedman

Auburn: Auburn W. Dept.

Avon: Clark

Babylon: Five

Balliston Spa: W. Dept.

Batavia: Cook, Supt. of W., Zollner

Bay Shore: Fenn

Briarcliff Manor: Manahan

Brockport: Glynn

Buffalo: C. K. Bassett, G. B. Bassett, Bates, Bergman, Bingham & Taylor Corp., Buffalo Div. of W., Buffalo Meter Co., Buffalo Niagara Elec. Corp., Creager, Dewey, Drake, Gardner, Michael Hayman & Co. Inc., Hoefling, Keirn, Nussbaumer, Rice, Showell, Sterling Engine Co., Svenson, Thomas, Velzy

Canajoharie: Bullock

Canandaigua: Ellis

Chateaugay: Johnson

Cobleskill: Dyer

Corning: Drake, Wright

Cortland: Ford

Dunkirk: Bd. of W. Com.

East Aurora: Village of East Aurora, Shed

Elmira: Elmira W. Bd., Kennedy Valve Mfg. Co., The Shelt Co.

Endicott: Conradi, Endicott W. W. Co.

Fishers Island: Fishers Island Farms Inc.

Frankfort: Shea

Fredonia: Cranston, Heubi

Freeport: McKague, Southard, Tetzlaff

Garden City: Inc. Village of Garden City

Glen Cove: Ogden

Glen Head: Tappen

Glens Falls: Glens Falls Bd. of W. Com.

Gloversville: Becker, Davies, Vrooman

Hamburg: Roberts, Sterns

Hamilton: Albrecht

Hempstead: Inc. Village of Hempstead

Herkimer: Wood

Hicksville: Hicksville W. Dist.

Holland: Holland W. Dist. No. 1

Hornell: Gorman

Hudson: Herron, Dept. of Pub. Works

Ilion: Bd. of W. Com.

Iona Island: Palisades Interstate Park Com.

Irvington: Eggerling, Murphy

Ithaca: Carpenter, Malcolm, Seery, Stanley, Straub, Walker

Jamestown: Bernhardt, Bd. of Pub. Util., Johnson

Johnson City: Johnson City W. Dept.

Kingston: Darrow, Muddiman

Lackawanna: Kurtz

Larchmont: Hotchkiss

Le Roy: O'Mealia

Little Falls: Austin

Lockport: Hooker

Lowville: Adirondack W. W.

Lynbrook: Rowley, Stearns

Malone: Van Deusen

Mamaroneck: Thrasher

Massapequa: Bornemann

Maybrook: W. Bd.

Mechanicville: Sage

Middletown: Bull, Gates

Mineola: Hendrick, Nassau County Dept. of Health

Mohawk: Martin

Montgomery: Bd. of W. Com.

Monticello: Divine

Mount Kisco: Harding, Mathews

Mt. Morris: W. Dept.

Mount Vernon: Manahan, Scott, Theobald, Wolbert

Munnsville: Ackerman

New Rochelle: Cranch, Gooding

New York City

Bronx: Fassnacht, Riddick, Saville, Whitley

Brooklyn: Aeryns, Armstrong, Flannery, Hale, Horandt, Kenny, Kneale, National Meter Co., Nesin, Roux, Wright

Manhattan: Abrams, Allen, American City Magazine, American Cyanamid & Chem. Corp., American W. W. & Elec. Co. Inc., Applebaum
Bachmann, L. A. Baldwin, R. T. Baldwin, Ballou, Barnhill, Barrett Co., Bell, Bennett, Berry, Biggs, Blanchard, Blum, Bogert, Booth, Bowe, Bowers, Boyd, Brush, Burns
Canariis, Case, Central Foundry Co., Centriline Corp., C. M. Chenery, C. T. Chenery, Chevalier, Cleverdon, E. Shaw Cole, Edward S. Cole, Community W. Serv. Co., Copper & Brass Research Assn.
Darco Corp., Dennett, Donaldson, Dorr Co. Inc.
Ebasco Services Inc., Electro Bleaching Gas Co., Emerson, Engineering News-Record, Enslow
Faber, Federal Advisers Inc., Flinn, Ford, Freer
Geisler, Goodman
Haiss, Hansen, Hazen, Helbig, Hoag, Hochlerner, Hoffman, Hollander, Horn, Huy
Inglee
Jacobs, Jenkins Bros., Johns-Manville Sales Corp., Johnson, Jones
Kendall, Kienle, Killam, Krell, Kriegsheim
Lang, Lead Industries Assn., Ledden, Luce

Mailler, Mann, Mathieson Alkali Works Inc., Meyerherm, Miller, Murdoch
National W. Main Cleaning Co., Nelson, Neptune Meter Co., Newsom, Nordell, Northeastern W. & Elec. Serv. Corp., Northrop, Nuebling
Ornstein, Overholt
Palmer, Papps, Pardee, Patitz, Patton, Permutit Co., E. B. Phelps, E. S. Phelps, Pincus, Pirnie, Pirnie Jr., Pitometer Co., Potts, Public Works
Quigley Co., Quilty
Revere Copper & Brass Inc., Robbins
L. A. Salomon & Bro., Sanborn, Saunders, Sawyer, Scharff, Scott, Seabury, Seifert, Shuldener, Sigworth, Sinclair, Solvay Sales Corp., Stevenson, Stillwell
Tainter, Thomson Meter Co., Trowbridge, Turner, Tuttle
Van den Berg, Van Reenen, Velz, Vermeule
Wafer, Wagner, Walker, Warren Foundry & Pipe Corp., Water Works Eng., Wertz, West Va. Pulp & Paper Co., Whitlock, Wiggin, Wilson, Wolff, Wood, Wrench, Wyckoff
Zentner

Queens: Aldrich, Ankener, Citizens W. Supply Co. of Newtown, Diven, Edwards, Farley, Hapgood, Henderson, Keily, Kydd, Laase, Lamb, Ley, Pardee Eng. Co., Rau, Shapiro

Richmond: Phoenix Meter Corp., Warde

Newark: Wright

Newburgh: Howes

Niagara Falls: Dignan, Hooker Electrochem. Co., Mann, Piper, Robbins, Roe

North Creek: North Creek W. Dist.

North Tonawanda: Oelkers

Olean: Bd. Of W. Com.

Oneida: Clark, Sherrill-Kenwood W. Com.

Oneonta: Rock, Watkins

Ossining: Miller

Oswego: McCaffrey, Dept. of W.

Owego: Owego W. W.

Peekskill: Irish, Naylor, G. P. Wood, J. Wood

Phelps: Henry

Pleasantville: Day

Port Chester: Homelite Corp.

Port Ewen: Tinnie

Port Jervis: Sheldon

Port Washington: Jordan

Poughkeepsie: Cole, Kiker, Bd. of Pub. Works, Seeholzer, Walker

Rensselaer: Claflin

Richfield Springs: Richfield Springs W. Com.

Rochester: Abbs, Baker, Barth, Edwards, Gordon, Hines, Hopper, Howe, Jones, Kohl, Lewis, Little, Lozier, Monroe Ave. W. Dist., Moore, Morrison, Mussi, Price, Roberts, Russell, Shnidman, Smith

Rockville Center: Patten

Rome: Rome Bureau of W.

Roslyn Heights: Vybiral

Rye: Bergman

Salamanca: Weagraff

Saranac Lake: Stalbird

Saratoga Springs: Grooms

Scarsdale: Boniface, Collins, Conlan, Henshaw

Schenectady: City of Schenectady, Devendorf, Taylor

Seneca Falls: Seneca Falls W. Dept.

Sherburne: Champ

Silver Creek: Silver Creek W. W.

Skaneateles: Horsington

Snyder: Gibney

Sodus Point: Comstock

Spring Valley: Mosier

Sylvan Beach: Freiberger

Syracuse: Daw, Dorrance, Elder, Hart, Korves, Mitchell, Mower, Syracuse Dept. of Eng., Thompson, Wagenhals

Tarrytown: Helling, Losee, Nolan

Thornwood: Jiannott

Tonawanda: Korff, Siegmund

Troy: Bureau of W., Caird, Clifton, End, W. & L. E. Gurley, Keis, Knickerbacker, Ludlow Valve Mfg. Co., Rensselaer Valve Co., Ross Valve Mfg. Co. Inc., Solomon.

Union: Ware

Utica: Hodges, Hopkins, Mattinson, Miles

Valhalla: Havill, Kelley

Voorheesville: Horton

Waterford: Eddy Valve Co., Yaxley

Watertown: Eddy, Field, Jennings

Waverly: Hall

Webster: O'Dell

Wellsville: Rowe

White Plains: Friese, Grantham, McLaughlin, White Plains Dept. of Pub. Works

Yonkers: Carroll, Harmonay

NORTH CAROLINA

Albemarle: Moore

Asheboro: Adkins, Yow

Asheville: Barnard, Burchard, Frisk

Black Mountain: Greene

Burlington: Ireland, Thomas

Canton: Seaman

Chapel Hill: Baity, Gotaas, Moggio, Thompson

Charlotte: Clapp, Davidson, Davis, Dickson, Doane, Franklin, Greenlee, Grinnell Co. Inc., Heyward, Le Clerc, Lee, Potter, Purser, Rawlins, Starling, Vest, Wooten

Concord: Brown, Fisher

Davidson: Kuhn

Durham: Davis, Durham W. Dept., Hall, Lubow, Malone, Phillips, Piatt, Redding, Rice

Elizabeth City: Luther, Parker

Gastonia: Henderlite, Rhyne

Granite Falls: Robinson

Greensboro: Gregory, Mengel, Smedberg, True

Greenville: Swartz

Hamlet: Thorp

Hendersonville: Lampley

Hickory: City of Hickory

High Point: Perkins

Laurinburg: Brannock

Leaksville: Smith

Lenoir: Williams

Lexington: Williams

Lincolnton: Randall

Lumberton: McNeill

Mebane: Michael

Morganton: Kearney

Mount Airy: City W. Dept., Merritt

Murphy: Johnson

Oxford: Evans, King

Pisgah Forest: Ecusta Paper Corp.

Raeford: McMillan

Raleigh: Abell, Andrews, Bain, Booker, Cook, Grady, Holding, Jarrett, E. M. Johnson, T. S. Johnson, Kellogg, Olsen, Peirson

Rockingham: Tull

Rocky Mount: Lyon

Salisbury: English, Lesslie

Sanford: Spence

Selma: Chamblee

Shelby: Toms

Southern Pines: Van Camp

Swannanoa: Parks, Shore

Thomasville: Witty

Wadesboro: Ratliffe

Warrenton: Warrenton W. Co.

Waynesville: Sloan

Wilmington: Lassiter, Maffitt

Winston-Salem: Ebert, Thomas

NORTH DAKOTA

Bismarck: Clark, Yegen

Fargo: Ayliffe, Kirk, Tarbell

Grand Forks: Jenson

OHIO

Akron: Barstow, Elting, Goodman, Hoffman, La Due, Sherbondy, Thomas

Avon Lake: Britton

Barberton: Babcock & Wilcox Co., Claggette, Columbia Alkali Corp.

Berea: Dorland

Bowling Green: City W. Co.

Bucyrus: Lower

Cadiz: Hanna

California: Bahlman

Canton: Schlott

Chillicothe: Chillicothe W. Co., Hibbs, Ruff

Cincinnati: Bourbon Copper & Brass Works Co., Bready, De Martini, Duhme, Eberling, Evans, Hoffman, Hoskins, Irwin, Le Bosquet, Mace, Newhall, H. C. Nutting Testing Engrs., Rimmer, Sahnd, Tisdale, Trout

Cleveland: Addressograph-Multigraph Corp., Antweiler, Barnes, Black, Braidech, Danner, Ellms, Elwell, Farnan Brass Works Co., Fischer, Gascoigne, General Paint Corp., Fred W. Hanks Co., Harlamert, Havens, Hickery, Law, Levy, Lewis, MacDowell, MacLachlan, Magill, Marsh, Marshall, Meissner, Moses, Nutting, O'Day, Pease, Quayle, Republic Steel Co., Riehl, Sangdahl, L. P. Smith, R. B. Smith, Statham, Tolles, Wallene

Columbus: Albert, Blaik, Burgess, Crane, Foulk, Hoover, Hoyt, Jeffrey Mfg. Co., Kimberly, Knox, Krumm, Lathrop, Martin, McIntyre, Moore, Nicklis, Prior, Scott, Shenker, Tolman, Walker, Waring, Water Leak Detector Co.

Conneaut: Harvey

Dayton: Electro Rust-Proofing Co., Kline, Layport, Morehouse

East Liverpool: Larkins

Eaton: Beatty

Findlay: Foltz

Fremont: Schneider

Girard: Reep

Grafton: Hahn

Holloway: Craig

Huron: Aicher

Ironton: Mahl

Jackson: Brunton

Kent: Gettrust, Hostettler, Young

Killbuck: Kuhns

Lakewood: Moore

Lima: Smith, Stimmel

London: Amrine

Mansfield: Gorman-Rupp Co.

Marietta: Eggleston

Marion: Hall

Martins Ferry: Jenkins

Marysville: Banks

Massillon: Peerless Pump Div., Ulrich

Miamisburg: Price, Wall

Middletown: American Rolling Mill Co., Barnard, Gebhart, Neill

Milford: D. R. Erion, R. Erion

Montpelier: Hoover

Napoleon: Adams, Kelley

Orrville: Specht

Painesville: Cook

Piqua: Rauscher

St. Clairsville: Hardesty

Salem: Kennedy

Sandusky: Schoepfle

Struthers: Carty, Evans

Toledo: Applegate, O. E. Clark, W. G. Clark, Finkbeiner, Furman, Henry, Jones, Lynch, Schoonmaker, Stepleton, Williams

Troy: Driskell

Warren: Hapgood, Inman, O'Connor

Wellston: Talbott

Wellsville: Tarr

West Milton: Farver

Youngstown: Fawcett, Lyden & McFarlin, Russell, Schmidt, Vagnozzi, Van Arnum, Youngstown Sheet & Tube Co.

OKLAHOMA

Barnsdall: Bennett

Bartlesville: Huntress

Broken Bow: Foster

Chickasha: McBurnett

Claremore: Sprangle

Cordell: Hilton

Duncan: Sanders

El Reno: Harrell, Hromada

Enid: Brown, Harrison

Foss: Williams

Frederick: Zumwalt

Hobart: Benedict

Holdenville: Shurley

Hollis: Ables

Muskogee: Anderson

Nowata: Pate

Okemah: Harding

Oklahoma City: Bretz, Contant, Cunningham, Dunlap Co., Long, Schouten, Scott, Sherman Machine & Iron Works, Van Gilder

Okmulgee: Wheatley

Perry: Daniels

Shawnee: Edge

Stillwater: Smith, Stapley

Stroud: Walker

Tulsa: Cecil, Holway, McMurry, Ozark Chem. Co., W. Dept.

Yukon: Fanning

OREGON

Ashland: W. Dept.

Baker: Depts. of W. Fire & San., Stockman

Bend: Drost, Smithson

Burns: Lowe

Corvallis: Gallagher, Merryfield

Dallas: Soehren

Eugene: Eugene W. Bd.

Grants Pass: Signor

Maplewood: Hoffman

Marshfield: Chiene

McMinnville: McMinnville W. & Light Dept.

Medford: Calif. Oregon Power Co., W. Com.

Milton: Brower

Multnomah: Home W. Dist.

Newport: Case

Pendleton: Adams, Vaughan

Portland: Benedict, Boyle, Bureau of W. W., Butler, Charlton, Corey, Cunningham, Dodson, Fague, Gearhart, Gibson, Green, Hamilton, Hampton, Hanning, Judson, Karr, Kipp, Koon, Lawrence, Morrow, Olsen, Romig, Stober, Strasser, Strudgeon, Thompson, Wagner, Willard

Redmond: Heighes

Salem: Salem W. Com., Van Patten

Silverton: McCleary

Tillamook: Berkey

Toledo: French

West Linn: Volpp

Woodlawn: Kleinsmith

PENNSYLVANIA

Abington: Gilbert

Aliquippa: Moore

Allentown: Allentown Bur. of W., Krum

Altoona: Ale, Swab

Ambler: Keasbey & Mattison Co.

Ambridge: Crawford

Aspinwall: Drake

Beaver Falls: Burnie

Bellevue: Barton

Berwick: Multiplex Mfg. Co.

Bethlehem: Bethlehem Steel Co.

Braddock: Dillon

Bradford: Boncher, Dresser Mfg. Co., Mackie, Stewart

Bristol: Roberts

Bryn Mawr: Davis, Jenkins, McCurdy, Philadelphia Suburban W. Co., Shull

Burgettstown: Columbia

Butler: Kelley

Carbondale: McMullen

Chambersburg: Mowrey

Chester: Dodd, Muser

Clearfield: Nevling

Coatesville: Emigh

Donora: Gouger

Downingtown: Wagner

Du Bois: Bur. of W., Warren

Easton: Johnson

Emaus: Donaldson Iron Co.

Emporium: Emporium W. Co.

Erie: Dunwoody, Hays Mfg. Co., Lechner

Ford City: Wintgens

Freeport: McDivitt

Glen Rock: Lutz

Greensburg: Pearl, Welsford

Harrisburg: Beckwith, Berry, Craig, Daniels, Dixon, Gannett, Glace, Matter, Moses, Strickler

Hazleton: McGeehin

Homer City: Syntron Co.

Honesdale: Williams

Indiana: Pharaoh

Jenkintown: Whitcomb

Jersey Shore: Jones

Johnstown: Byers, Hagins, Kunkle, Ogburn

Kittanning: Bowser, Turping

Lancaster: Abraham, Duckworth, Goodell, Hoak

Langhorne: Stompler

Lansdowne: Mitchell

Lebanon: McAdam

Lemoyne: Buttler

McDonald: Stout

McKeesport: Trax

Meadville: Ellsworth, Harvey, Krum, Young

Media: Johnson

Mertztown: Atlas Mineral Products Co. of Pa., Wirtz

Milton: Keim

Mt. Union: Diven

Natrona: Knight

Nazareth: Flory

New Brighton: Goehring

New Castle: Johnson

New Kensington: Griffiths

North East: Hutchinson

Northampton: De Groot

Oil City: Oil City Bur. of W.

Philadelphia: American W. Softener Co.
Baker, Bean, Becker, Beltz, Betz, Bingham, Boardman, W. A. Briggs Bitumen Co. Inc.
Caplan, Corin, Crawford
Daugherty
Friel
Glueck, Goff, Greer
Haydock, Haywood, Hedgepeth
Ickler
Joos
Kappe, Kerr
Lawrence, Leadite Co. Inc.
McKay
Nelson
Oppermann, Ozone Processes Inc.
Pennsylvania Salt Mfg. Co.
Read, Ridenour, Roberts Filter Mfg. Co., Russell
Schaut, Sheen, Simplex Valve & Meter Co., Strockbine
Taylor, Turner
U. S. Pipe & Foundry Co.
Van Loan
Welch, Weston, R. D. Wood Co., Wood

Philipsburg: Rumberger

Pittsburgh: Bankson, Baton, Boyles, A. M. Byers Co.
Calgon Inc., Campbell, Chester, Cochrane
Davis, Diamond Alkali Co., Donnan, Dotterweich, Durner
Golden-Anderson Valve Specialty Co.
Hendrickson
Jacobs, Johnson
Kennon, Kneeland
Linderman, Lynn
Mansfield, McCrory, Mellon, Murdoch
National Tube Co.
Ohio Salt Co.

Pittsburgh-Des Moines Steel Co., Pittsburgh Equitable Meter Co.
Redington, C. W. Rice, O. Rice, Rockwell
Scheinert, Snyder
U. S. Steel Corp.
Weidlein

Pottstown: Grubb

Pottsville: Clayton

Punxsutawney: Startzell

Reading: Boas, Chubb, Heine, Leh, Merkel, O'Reilly, Reading Bur. of W., Sperry

Rockwood: Stewart

Roulette: Gray Chem. Co., Twining

Sayre: West

Scranton: Dark, Howe, Lyle, Scranton-Spring Brook W. Service Co., Taylor

Selinsgrove: Eyer

Sewickley: Com. of W. W., Reinhold

Shamokin: McWilliams

Sharon: McBride, Shenango Valley W. Co.

Smethport: Oviatt

Somerset: Pile

Spring Grove: Hinman

State College: Gulden, Mavis, Turner, Walker

Tarentum: Jackson

Tyrone: Hassler, Laughlin

Uniontown: Farson

Verona: Suburban W. Co.

Washington: Buchanan, Malone, Patterson, Pollock

Waynesboro: Fitz, Shank

West Conshohocken: Connor

West Lawn: Keiser

Wilkinsburg: Adams, Fox

Williamsport: Barrick, Darling Valve & Mfg. Co., Keliher, Williamsport W. Co.

Wynnewood: Freeburn

York: Brisbane, Kable, S. Morgan Smith Co.

Zelienople: Lauten

RHODE ISLAND

Bristol: Carns

Providence: Builders Iron Foundry, Dillon, Proportioneers Inc., Providence Dept. of Pub. Works, Reynolds, Richardson

Rumford: Turner

SOUTH CAROLINA

Abbeville: Townsend

Aiken: Sudlow

Anderson: Swittenberg

Bennettsville: Parks

Camden: Tobin

Charleston: Com. of Pub. Works, Gibson, McDowell, Parker Lab.

Chesnee: Marquis

Chester: McLure

Clemson: Jordan, Watson

Columbia: Barber, Rice, Ryan, Tomlinson, White

Dillon: Davis

Easley: Rogers

Gaffney: Gaffney

Georgetown: Heselden

Greenville: Blackwelder, Hawkins, Perry

Greenwood: Chapman

Greer: Lawing

Laurens: Lovejoy

Lyman: Bright

Mullens: Brown

Newberry: Schumpert, Wise

Orangeburg: Johnstone, Pearson

Parr: Regenfuse

Rock Hill: Cranford, Garrison

Saluda: Setzler

Spartanburg: Simms, White

Sumter: Ellis

Union: Howe

Winnsboro: Meng

SOUTH DAKOTA

Aberdeen: Guhin, Wells

Mitchell: Holst, Mather

Pierre: Mathews, Towne

Sioux Falls: Connor, Rees, Sioux Falls W. W.

Sturgis: Davenport

Vermillion: Ohlmacher

TENNESSEE

Alcoa: Bristol

Ashland City: Barker

Bristol: City of Bristol

Chattanooga: Lofton, Morrison, Porzelius, Shawver, Stromquist

Cookeville: Collier

Dyersburg: Blakeman

Elizabethton: Jessee

Erwin: Brown

Fountain City: Brickey, Murphy

Gleason: Rucker

Greeneville: McAmis

Kingsport: King, Tenn. Eastman Corp.

Knoxville: Clouser, Knoxville Elec. Power & W. Bd., Quinn, Stephenson

Lenoir City: Kavanagh

Madison: Madison Suburban Util. Dist. of Davidson County

Maryville: Rhynus

McMinnville: Womack

Memphis: Bd. of Light & W. Com., Fletcher, Hoshall, Layne & Bowler Inc., Seay

Murfreesboro: Lovell

Nashville: Farrell, Holman, Kittrell, Lawrence, Lewis, Morton, Saindon, Schmidt

Old Hickory: Eldridge

Signal Mt.: Guthrie

Union City: Powell

Watts Bar Dam: Fletcher

TEXAS

Albany: Gibson

Amarillo: Moss

Austin: Davis, Ehlers, Graves, Green, Schoch

Ballinger: Northington

Beaumont: Barnhagen, Merritt, Vieno

Big Spring: McDaniel

Bryan: Connell

Cleburne: Reid

Corpus Christi: Central Power & Light Co., City of Corpus Christi, Cunningham, Weisse

Corsicana: McAfee, Mowlam

Crystal City: Williams

Dallas: Baker, Billings, Brown, Chambers, Connell, Crossman, Cullum, Dellone, Dixon, Forrest, Fowler, Hanlon, Hoefle, McCormick, Miner, Morey, Morrison, Myers, Puckhaber, Rosenthal, Smith, Southern Alkali Corp., Taylor, Whedbee, J. B. Winder, N. G. Winder

Denison: Brenneke

El Paso: Hinyard, W. Dept.

Electra: Harris

Ennis: Lewis

Ferris: Gleeson

Fort Worth: Consolidated Chem. Industries Inc., Hawley, Mahlie, McArthur, Porter, Quigley, Robinson, Well Machinery & Supply Co.

Freeport: Axelrad

Fritch: Hammerschmidt

George West: Lamm

Gladewater: Shockley

Greenville: Mitchell

Haskell: Gilstrap

Henderson: Horner, Owens

Highland Park: Thomas

Hillsboro: James

Houston: Bakke, Bock, City of Houston W. Dept., Elrod, Estes, Fugate, Grantham, Gude, Jensen, Wallace

Jacksonville: Johnston

Kilgore: Collins

Laredo: Umbenhauer

Lubbock: Decker, Texas Tech. College Library

Marlin: Goodrich

McCamey: Coulter

Midland: Cole

Mineral Wells: City W. W., Williams

Nacogdoches: Smith

Ozona: McDonald

Paris: Hicks

Plano: Steenson

Port Arthur: Swanson

Prosper: Sanders

Richardson: Ashby

Rule: Pruitt

San Antonio: Bartlett, Helland, City W. Bd. of San Antonio

San Benito: Clark

South San Antonio: Harding

Sulphur Springs: Raney

Sweeny: J. S. Abercrombie Co.

Sweetwater: Duckett

Temple: Gresham, Powell

Tyler: Lloyd, Presley

Uvalde: Evans

Waco: Abrams, Gooch, Rohan

Wichita Falls: Dickson, Norris, Ward

UTAH

Ogden: Irwin

Provo: Newell, Pacific States Cast Iron Pipe Co.

Salt Lake City: Arnold, Painter, Salt Lake City Corp. W. Dept., Thatcher

VERMONT

Burlington: Moat, Rickard

Manchester Center: Marsden

Middlebury: Brackett

VIRGINIA

Alexandria: Lamond

Arlington: Engle, Lundberg

Ashland: Hartsook

Blacksburg: McGauhey

Bristol: City of Bristol

Danville: Brantly, Johnson

Denbigh: Pharr

Falls Church: Anderson

Fredericksburg: Leveque

Galax: Stockner

Harrisonburg: Myers

Lawrenceville: Hayes

Lexington: Boykin, Hanes, Rice

Lynchburg: Burnett, Capron, Glamorgan Pipe & Foundry Co., Glenn, Lynchburg Foundry Co., Odor, Snead, Spencer, Wagner, Wilson, Woodson

Newport News: Dugger, Harman

Norfolk: Fitzgerald, Herbert, Layne-Atlantic Co.

Richmond: Baldwin, Bardwell, Bingley, Lordley, Meredith, Messer, Phipps & Bird Inc., Royer, Ruehl, Smith, Snidow, Strother, Thomas, Trimble

Roanoke: Crockett, Moore, Taylor

Salem: Massey

Winchester: Grant

WASHINGTON

Aberdeen: Watkins

Auburn: Gosney

Bellingham: W. Dept., Binzer, Bow, Byron, Campbell, Gooch, Hanning, Trunkey

Bremerton: Casad

Camas: Smith

Cashmere: Jarvis

Cathlamet: McGowan

Cheney: Chambers

Chewelah: Bunker

Colfax: Chase

Dayton: Bamford

Endicott: Poffenroth

Enumclaw: Morgan

Everett: Everett W. Dept.

Goldendale: Wilson

Hoquiam: Breitenbach, Heermans, Lovejoy

Kelso: Thornton

Kent: Rod

Longview: Labsap

Lynden: Knittel

Menlo: Hazen

Mount Vernon: White

Okanogan: Van Liew

Olympia: Williams

Omak: Hubbert

Oroville: Le May

Pasco: McGhee

Port Angeles: White

Pullman: Nelson, Snyder

Raymond: Buckingham

Renton: Morrison

Seattle: Botten, Campbell, Cook, De Waissey Federal Pipe & Tank Co., Fowler, Gibson, Hallgren, Harris, Hill, Jacobs, Johnson, Lindsey, Marckmann, Martinsen, Miller, Mitchell, Murray, Osborne, Parks, Purcell, Schunke, Seattle W. Dept., Seufer, Tangney, Tyler, Wartelle

Shelton: Eck

Snohomish: Lysons

Spokane: Erickson, Hedman, James, Jones, Judd, Supt. W. Div., Wash. W. Power Co.

Steilacoom: Harlock

Sumner: Coffman

Tacoma: Crosby, Eernisse, Hooker, Kunigk, Shaneman, Stenger

Vancouver: W. Dept.

Walla Walla: McLean

Wenatchee: Dunstan, Hickcox

Yakima: Gilman, Hall

WEST VIRGINIA

Alderson: Straight

Alloy: Topham

Ansted: Skaggs

Benwood: Davis

Bluefield: Rhoads

Charleston: Blair, Gidley, Harrington, Haynes, Kranaskas, MacDonald, McCall, McLaughlin, Moses, Musser, Pub. Serv. Com. of W. Va., Settle, Staub, Veador, Watson

Chester: Young

Clarksburg: Boynton, Highland

Clendenin: Cantley

East Rainelle: Hall

Fairmont: Kirchman

Hinton: Martin

Huntington: Dale, Edwards, Jones, Laudemann

Kermit: Stepp

Keyser: Blundon

Madison: Millar, Whitlock

Matewan: Smith

Morgantown: Hodge, Kelso, Speiden

Moundsville: Hetzer

New Cumberland: Parsons

Parkersburg: Underwood

Piedmont: Eger, Richards

Richwood: Gray

Sheperdstown: Waldeck

Sisterville: Hammel, Sandy

Spencer: Payne

Vienna: Justus

Weirton: Simmons

Welch: Clark

Wellsburg: Morgan

Wheeling: Todd

Williamson: Offutt

Williamstown: Boyd

WISCONSIN

Antigo: Jackson

Appleton: Dimick, Gallaher

Ashland: Snow

Delavan: Delavan W. Com.

Eau Claire: Brown

Elkhorn: Elkhorn Light & W. Com.

Evansville: Cary

Fond du Lac: City W. Dept.

Green Bay: Green Bay W. Dept.

Janesville: Griffey

Juneau: Kadinger

Kaukauna: Weckwerth

Kenosha: Kenosha W. Dept.

Kimberly: Rothchild

La Crosse: Murphy

Lake Geneva: O'Neill

Madison: Bruden, Domogalla, Gauer, Kessler, Kirchoffer, Mead, Muegge, Nichols, Shoemaker, Smith, Thiessen, Ward, Warrick, White

Manitowoc: Schroeder, Staeffler

Marshfield: Kipp

Menasha: Kuester

Milwaukee: Allis-Chalmers Mfg. Co., Badger Meter Mfg. Co., Bohman, Brown, Cunliffe, Cutler-Hammer Inc., Gruetzmacher, Ihling, Kerslake, McCarthy, Moore, Murphy, Rynders, Schmitt, Schwada, Thomas, Voelker, Wright

Neenah: Neenah City W. W.

Neopit: Bibelhausen

Oconomowoc: Oconomowoc W. Dept.

Oshkosh: Eichinger, Hintz, Schneider

Plymouth: McGuire

Portage: Bryan

Racine: Peirce, Quimby

Shawano: Page

Sheboygan: Bd. of W. Com., Donohue, Zufelt

South Milwaukee: Stosick

Stevens Point: Somers

Stoughton: Dahle

Superior: Corine

Two Rivers: Tomek

Watertown: Reichardt

Waukesha: Kuranz

Waupun: Towne

Wauwatosa: Henke

WYOMING

Casper: City of Casper

Cheyenne: Baldwin, Watson, Williams

Gillette: Streeter

Parco: Breniman

Rawlins: Davis

Rock Springs: Darling

CANADA

ALBERTA

Calgary: Robinson

Edmonton: City of Edmonton, Menzies, Watson

Wetaskiwin: Maggs

BRITISH COLUMBIA

Kimberley: Blezard

New Westminster: City of New Westminster

Vancouver: Belyea, Brakenridge, Cleveland, General Util. Co. Ltd., Perry, Rome

Vernon: Tassie

Victoria: Clark, Irwin

West Vancouver: Duncan

MANITOBA

Brandon: McFarlane

Winnipeg: Brickenden, Cameron, Foggie, Hurst, Lindsten, Main, Scott

NEW BRUNSWICK

St. John: Smith

St. Stephen: Laflin

NOVA SCOTIA

Kentville: Wightman

Truro: Gordon

ONTARIO

Amherstburg: Bernard

Barrie: Pub. Util. Com.

Beamsville: Reid
Belle River: Gauthier
Belleville: Pub. Util. Com.
Bowmanville: Chase
Bracebridge: Ball
Brantford: Adams, Patterson, Pub. Util. Com., Roberts
Brockville: Farquharson
Burlington: Edwards
Carleton Place: Rogers
Chatham: Chatham Bd. of W.
Chesley: Grabb
Cochrane: Oke
Cornwall: Campbell
Cooksville: Maxwell
Crystal Beach: Hallgren
Deseronto: Pub. Util. Com.
Dundas: Wright
Dunville: Pub. Util. Com.
Elmira: Bowman
Essex: Truesdale
Exeter: Lampman
Fonthill: Witherington
Forest: Ellerker
Fort Erie: Gray
Fort William: Symes
Galt: Cuthiell
Gananoque: Gananoque W. W. Com.
Goderich: Bridle
Guelph: City Engineer
Hamilton: Darling, Matheson, McFaul, Veale
Hawkesbury: Wang
Hespeler: Meyer
Ingersol: Hall
Islington: Dilworth
Kapuskasing: Corp. of Town of Kapuskasing
Kenora: Hooper
Kingston: Baty, Folger
Kirkland Lake: Spellman, Township of Teck
Kitchener: Kitchener W. Com., Pequegnat
Lindsay: Hammond
Listowel: Hanna
London: Buchanan, Charles, Hodkinson, McManamna, Pub. Util. Com.
Meaford: Brown
Merritton: Pub. Util. Com.
Midland: Midland Pub. Util. Com.
Napanee: Dafoe
New Liskeard: Sutcliffe
New Toronto: Berner, Pub. Util. Com.
Niagara Falls: Acres, Pringle, Warder
North Bay: City of North Bay
Orillia: Orillia W. Light & Power Com.
Oshawa: Oshawa Pub. Util. Com.
Ottawa: City of Ottawa, Ferguson, Leverin, MacDonald, Stockwell, Wight
Owen Sound: Waddell
Palmerston: Forster
Paris: Boucher
Perth: Smith
Peterborough: Dobbin, Hunt, Peterborough Util. Com.
Petrolia: Weaver
Picton: Tait
Port Arthur: Flook
Port Credit: Parkinson
Port Hope: Port Hope W. W. Com.
Preston: Preston Light & W. Com.
Renfrew: Stewart
Ridgetown: Campbell
St. Catharines: Jack, McPhail
St. Marys: St. Marys Pub. Util.
St. Thomas: Miller, Pub. Util. Com.
Sarnia: Hall
Sault Ste. Marie: Cornell
Seaforth: Pub. Util. Com.

Simcoe: Maxwell, Pub. Util. Com.

Smiths Falls: Allport

South Porcupine: Anderson

Stratford: Manson

Strathroy: Pub. Util. Com.

Streetsville: Drennan

Sudbury: Martindale

Tilbury: Tilbury Pub. Util. Com.

Timmins: Corp. Town of Timmins

Toronto: Allan, Angus
Berry, Bond
Canadian Engineer, Corbett
Township of East York
Fitzgerald
Hannan, Heath, Hitchman, Howard, Hutchinson
Johnston
Kinney
MacLaren, McDonald, McGarigle, McLean, McRae, Mills
Paisley, Potter, Proctor
Randall, Redfern, Routledge, Russell
Sanderson, Scarborough Pub. Util. Com., Storrie
Thompson, Tomlinson, Toronto Dept. of Works
Walker, Wraight
Township of York

Walkerville: Taylor

Wallaceburg: Bennett

Waterloo: Hertel

Watford: Fuller

Welland: Bd. of W. Com.

Weston: Peirson

West Toronto: Van Benschoten

Wheatley: Chute

Whitby: Whitby Pub. Util. Com.

Whiteside: Dallyn

Willowdale: Township of North York

Windsor: Armstrong, Gillett, Hanna, Keith, Kellner, Strickland, Windsor Util. Com.

Woodstock: Archibald

PRINCE EDWARD ISLAND

Charlottetown: McMillan

QUEBEC

Lachine: Deslauriers

Montreal: Bird-Archer Co. Ltd., Borgford, Cyr, Doig, Dorrance, Fairbairn, Field, Gaboury, Hill, Hutchison, Lafreniere, Lea, McCrady, Meadows, Plamondon, Tessier, Van Patter, Williamson

Shawinigan Falls: Dorion

Temiskaming: Grimmer

Trois-Rivieres: Dufresne

Valleyfield: Belanger

Verdun: Des Baillets, Harrington

SASKATCHEWAN

Moose Jaw: Fawkes

Regina: Regina W. W. Dept., Schaeffer

Saskatoon: Underwood

Swift Current: Ashford

Yorktown: Ritchie

CUBA

Camaguey: Campos

Cienfuegos: Torriente

Havana: Bequer y Herrera, Calcavecchia, Chediak, Chibas, Cia de Acueducto de Cuba, Cosculluela, Daniel, Docal, Fernandez y Simon, Garcia-Montes, Giquel, Goicoechea, Granda y Deben, Hernandez, R. A. Martinez, S. S. Martinez, Miguel, Montoulieu, Morales, Puente, Recio, Santana, Valdes Roig, Vallee, Zanetti

OTHER THAN UNITED STATES, CANADA AND CUBA

ALASKA

Juneau: Nasi

Ketchikan: Carlson

ARGENTINE REPUBLIC

Buenos Aires: Besselievre, Obras Sanitarias de la Nacion, Paitovi

Rosario: Buchanan, Lasso

AUSTRALIA

Melbourne: Bowen, Martin, Melbourne & Metropolitan Bd. of Works, O'Nial, Ritchie, Smith

Midland Junction: Limb

Mildura: Hughes

Queensland: Simmonds

Sydney: Nicol

Willoughby: Murray

BRAZIL

Rio de Janeiro: de Brito, Sampaio

Santos: Stavrowsky

BRITISH WEST INDIES

Jamaica: Kirkpatrick

CANAL ZONE

Balboa: Hatch

Cristobal: Dunn

CHINA

Shanghai: Rial

COLOMBIA

Barranquilla: Armstrong, Urueta

Bogota: Bruhn, de Narvaez, Guerrero, de Santamaria, Noguera

Santa Marta: Barraneche

COSTA RICA

San Jose: Picado

CZECHOSLOVAKIA

Kaznejov: Kanhauser

DENMARK

Copenhagen: Jarvis

ENGLAND

Birmingham: Golder

Bournemouth: Moon

Harrow: Waddington

Lincoln: Whitely

London: Barham, Cook, Dagley, Green, Howland, Liffen, Moir, Paterson

Manchester: Hallam

Orpington: Compton

Staines: Palmer

Westminster: Temple

Wolverhampton: Page

FEDERATED MALAY STATES

Kuala Lampur: McDiarmid

FRANCE

Correze: Paul

Montrouge: Pain

Nancy: Imbeaux, Marcel

Paris: Chidaine, Michau

GERMANY

Berlin: Marquardt

Dresden: Vollmar

Stuttgart: Link

GREECE

Athens: Gausmann, Georgalas

GUATEMALA

Guatemala City: Compania del Agua del Mariscal, S. A.

HAWAII

Hilo: McMorrow

Honolulu: Bd. of W. Supply, Hawaiian Pineapple Co. Ltd., Springer, Tay

HOLLAND

Utrecht: Utrechtsche Waterleiding-Maatschappij

HUNGARY

Budapest: Vojcsik

INDIA

Calcutta: Deo, MacGregor

Manbhum: Aga

ITALY

Bergamo: Rocca

Milan: Cambi

JAPAN

Hyogo-Ken: Takeuchi

Tokyo: Ford

MEXICO

Chihuahua: Valenzuela

Mexico City: Banco Nacional, Gama, Holste, Villa-Acosta, Zapata

Obregon: Molina

Tacubaya: Cornejo

Veracruz: Alarcon

NEW ZEALAND

Dunedin: Scoular

PHILIPPINE ISLANDS

Manila: Metropolitan W. Dist., Perlas

PORTUGAL

Cascaes: Garcia

SCOTLAND

Dundee: Fulton

Edinburgh: Baxter

Monkton: Ball

STRAITS SETTLEMENTS

Penang: Holmes

Singapore: Murnane

SWEDEN

Göteborg: Göteborgs Vattenledningsverk

Hälsingborg: City W. Dept.

Malmö: Malmö Byggnadskontor

Stockholm: Von Greyerz

URUGUAY

Montevideo: Altoberro

VENEZUELA

Caracas: Bunker, Hurtado, Leon, Lilue, Lugo, Martinez-Ponte, Perez, Rodriguez-Vicentini, Sanchis, Stone, Stolk, Uban, Vicentini

MEMBERSHIP BY SECTIONS

The total membership figures for each section in this table are listed directly after the section name and are in bold-face type. The break-down of the sections by states and provinces follows the total in which it is included.

Section	*Active and Honorary*	*Corp.*	*Assoc.*	*Affil.*	*Junior*	*Total*
California	**421**	**38**	**22**	**—**	**1**	**482**
Arizona	8	—	—	—	—	8
California	411	37	22	—	1	471
Nevada*	2	1	—	—	—	3
Canadian	**180**	**41**	**2**	**2**	**1**	**226**
Alberta	4	1	—	—	—	5
British Columbia	10	2	—	—	—	12
Manitoba	8	—	—	—	—	8
New Brunswick	2	—	—	—	—	2
Nova Scotia	2	—	—	—	—	2
Ontario	124	37	1	2	1	165
Prince Edward Island	1	—	—	—	—	1
Quebec	24	—	1	—	—	25
Saskatchewan	5	1	—	—	—	6
Cuban	**26**	**1**	**—**	**—**	**—**	**27**
Florida	**69**	**6**	**1**	**2**	**—**	**78**
Four States	**158**	**7**	**18**	**1**	**1**	**185**
Delaware	5	—	1	—	—	6
District of Columbia	16	1	—	—	—	17
Maryland	32	1	1	1	—	35
Pennsylvania (eastern)†	105	5	16	—	1	127
Illinois	**176**	**6**	**19**	**—**	**1**	**202**
Indiana	**106**	**15**	**4**	**3**	**1**	**129**
Kentucky-Tennessee	**78**	**10**	**2**	**—**	**—**	**90**
Kentucky	40	5	1	—	—	46
Tennessee	38	5	1	—	—	44
Michigan	**94**	**5**	**4**	**5**	**—**	**108**
Minnesota	**62**	**9**	**3**	**1**	**—**	**75**
Minnesota	56	9	3	1	—	69
North Dakota*	6	—	—	—	—	6
Missouri Valley	**167**	**15**	**11**	**1**	**1**	**195**
Iowa	46	6	2	—	—	54
Kansas	24	3	—	—	—	27
Missouri	75	2	7	1	1	86
Nebraska (eastern)‡	12	3	2	—	—	17
South Dakota	10	1	—	—	—	11
Montana	**37**	**5**	**—**	**—**	**—**	**42**

MEMBERSHIP BY SECTIONS—*Concluded*

Section	*Active and Honorary*	*Corp.*	*Assoc.*	*Affil.*	*Junior*	*Total*
New England	**117**	**5**	**15**	**—**	**—**	**137**
Connecticut	29	2	5	—	—	36
Maine	15	—	—	—	—	15
Massachusetts	62	1	8	—	—	71
New Hampshire	2	1	—	—	—	3
Rhode Island	5	1	2	—	—	8
Vermont	4	—	—	—	—	4
New Jersey	**170**	**18**	**9**	**14**	**3**	**214**
New York	**342**	**46**	**43**	**5**	**7**	**443**
North Carolina	**94**	**5**	**1**	**1**	**2**	**103**
Ohio	**149**	**2**	**17**	**4**	**—**	**172**
Pacific Northwest	**126**	**17**	**1**	**13**	**—**	**157**
Idaho (northern) ⁂	6	2	—	—	—	8
Oregon	46	9	—	3	—	58
Washington	74	6	1	10	—	91
Rocky Mountain	**65**	**14**	**2**	**—**	**1**	**82**
Colorado	44	7	1	—	1	53
Idaho (southern) ⁂	3	2	—	—	—	5
Nebraska (western)‡	2	—	—	—	—	2
New Mexico	4	3	—	—	—	7
Utah	5	1	1	—	—	7
Wyoming	7	1	—	—	—	8
Southeastern	**149**	**8**	**5**	**3**	**1**	**166**
Alabama	34	2	5	1	—	42
Georgia	64	3	—	1	—	68
Mississippi	12	1	—	—	—	13
South Carolina	39	2	—	1	1	43
Southwest	**185**	**11**	**6**	**—**	**—**	**202**
Arkansas	17	2	—	—	—	19
Louisiana	25	—	—	—	—	25
Oklahoma	36	1	3	—	—	40
Texas	107	8	3	—	—	118
Virginia	**47**	**1**	**4**	**—**	**—**	**52**
Western Pennsylvania†	**88**	**6**	**13**	**3**	**1**	**111**
West Virginia	**35**	**1**	**—**	**20**	**—**	**56**
Wisconsin	**65**	**8**	**3**	**—**	**—**	**76**
Outside U. S., Canada & Cuba	**104**	**11**	**—**	**1**	**—**	**116**
Total All Sections	**3,310**	**311**	**205**	**79**	**21**	**3,926**

* Nevada and North Dakota are not within the territory of any section. The members here enumerated are listed under the sections the members have chosen individually in accordance with the By-Laws, Art. VII, Sect. 5.

† Pennsylvania is divided between the Western Pennsylvania Section and the Four States Section, the dividing line being at longitude 77°–45′ W.

‡ Nebraska is divided between the Missouri Valley Section and the Rocky Mountain Section, the dividing line being at longitude 100° W.

⁂ Idaho is divided between the Pacific Northwest Section and the Rocky Mountain Section, the dividing line being at latitude 45° N.

DIRECTORY OF COMMITTEES

GENERAL COMMITTEES

EXECUTIVE COMMITTEE OF THE DIRECTORS

Norman J. Howard, *Chairman*
Louis R. Howson
Linn H. Enslow
S. F. Newkirk
John A. Kienle

GENERAL POLICY COMMITTEE

Representing A. W. W. A.

J. Arthur Jensen, *Chairman*
Norman J. Howard
Reeves Newsom
Eugene F. Dugger
W. W. Hurlbut

Representing W. W. Mfrs. Assn.

John A. Kienle
Denis F. O'Brien

This is a standing committee charged with the duty of formulating basic policies of the Association with regard to the field and extent of its activities, the development of Local Sections and a number of other broadly related and fundamental subjects.

PUBLICATION COMMITTEE

Linn H. Enslow, *Chairman*
Wm. W. Brush
Edgar J. Buttenheim
Chas. A. Capen, Jr.
W. W. DeBerard
Roger W. Esty
Louis R. Howson
J. Clark Keith
Samuel B. Morris
Reeves Newsom
Wm. J. Orchard
Malcolm Pirnie
Geo. J. Rohan
N. T. Veatch, Jr.
W. Victor Weir
Abel Wolman
Harry E. Jordan (*Ex officio*)

This committee plans the annual convention program and has general control of all publications.

CONSTITUTION AND BY-LAWS COMMITTEE

Ross L. Dobbin, *Chairman*
Eugene F. Dugger
George H. Fenkell
Harry E. Jordan
Dale L. Maffitt

This committee considers and gives recommendations as to desired amendments to the Constitution or By-Laws of the Association. It also passes

upon all new By-Laws, or amendments to the By-Laws, of Divisions and Sections of the Association.

HONORARY MEMBERSHIP COMMITTEE

NORMAN J. HOWARD, *Chairman* — REEVES NEWSOM
J. ARTHUR JENSEN

This is a committee of the Directors. It makes recommendations for election to Honorary Membership in the Association. It usually is made up of the President and the last two Past Presidents.

THE JOHN M. DIVEN MEMORIAL MEDAL COMMITTEE

MALCOLM PIRNIE, *Chairman* — DALE L. MAFFITT
LINN H. ENSLOW — CHAS. H. SPAULDING
A. P. KURANZ

This committee makes recommendation to the Directors concerning the award of the Diven medal. It consists of the chairmen of the Water Works Practice and Publication Committees and the past chairman of each of the three Divisions.

THE JOHN M. GOODELL PRIZE COMMITTEE

EDWARD L. STAPLEY ('41), *Chairman* — WILLIAM L. MALCOLM ('43)
RALPH B. WILEY ('42)

This committee makes recommendation to the Directors concerning the award of the Goodell prize. Each member serves three years.

CONVENTION PLACE COMMITTEE

Representing the A. W. W. A.

EUGENE F. DUGGER, *Chairman*
REEVES NEWSOM
J. ARTHUR JENSEN
HARRY E. JORDAN

Representing the W. W. Mfrs. Assn.

JOHN A. KIENLE
DENIS F. O'BRIEN
MARTIN F. TIERNAN

This committee makes recommendation to the Directors concerning the location and date of the Association's annual convention.

CONVENTION MANAGEMENT COMMITTEE

Representing the A. W. W. A.

WM. J. ORCHARD, *Chairman*
REEVES NEWSOM
A. E. BERRY

Representing the W. W. Mfrs. Assn.

CLINTON INGLEE
J. HERMAN SMITH

Ex Officio

NORMAN J. HOWARD, *Pres., A. W. W. A.*
HARRY E. JORDAN, *Secy., A. W. W. A.*

LINN H. ENSLOW, *Chr., Publ. Comm. A. W. W. A.*
W. F. ROCKWELL, *Pres., W. W. Mfrs. Assn.*
JOHN A. KIENLE, *Secy., W. W. Mfrs. Assn.*
Note:—Karl M. Mann will succeed W. F. Rockwell on this committee October 1, 1940

This committee is in charge of the management of all details of the Association's annual conventions except the program and the choice of location and date.

COMMITTEE ON NATIONAL WATER POLICY

ABEL WOLMAN, *Chairman*
LOUIS R. HOWSON
THEODORE A. LEISEN
SAMUEL B. MORRIS
HOWARD S. MORSE

This committee is charged with the duty of observing the plans and actions of the Federal Government's National Resources Board and its allied groups and of representing the Association in any actions on subjects being considered by them.

COMMITTEE ON SOCIAL SECURITY LEGISLATION

DALE L. MAFFITT, *Chairman*

This committee, the organization of which was authorized in January, 1937, was formed for the purpose of following developments in Social Security Legislation and of keeping the Association informed on the subject.

COMMITTEE ON ASSOCIATION AWARDS

GEO. J. ROHAN, *Chairman*
JOHN B. HARRINGTON
FELIX SELIGMAN
E. C. TRAX
EARLE L. WATERMAN

This is a special committee, appointed by the Board of Directors. To it is assigned the duty of review of the terms of certain awards presently conferred as well as the consideration of possible additional awards, their nature and the terms upon which such awards should be based.

COMMITTEE ON SECTION ACTIVITIES OF CANADIAN MEMBERS

J. ARTHUR JENSEN, *Chairman*
A. E. BERRY
ROGER ESTY
M. H. McGUIRE
WADE PLUMMER

A special and temporary committee of the Board, appointed in 1940, to which is assigned consideration of the relationship of members of the A. W. W. A. residing in Canada to activities of Sections of the Association along the northern border of the United States.

WATER WORKS PRACTICE COMMITTEES

COMMITTEE ON WATER WORKS PRACTICE

MALCOLM PIRNIE, *Chairman*
FRANK A. BARBOUR
W. W. DEBERARD
R. L. DOBBIN
ARTHUR E. GORMAN
WM. W. HURLBUT
REEVES NEWSOM, *Vice-Chairman*
DALE L. MAFFITT
DENIS F. O'BRIEN
W. H. WEIR
ABEL WOLMAN

The Committee on Water Works Practice is in responsible charge and control of all technical activities of the Association. Article IX, Section 2 of the By-Laws states: "Any resolution, report or publication which undertakes to establish in the name of the Association, or any of its Sections or Divisions, professional or technical standards, shall be submitted to this Committee, and it shall direct all such matters on behalf of the Association. It shall give notice by publication to the membership of all such proposed standards and report its approval or disapproval of such to the Board. It shall appoint such Sub-Committees as it may deem necessary to properly carry on its work."

There follows the list of projects which have been authorized and the Sub-Committees which have been organized to carry on the activities under the direction of the Committee on Water Works Practice.

If the title of the project is not followed by one or a series of names, no work has been undertaken. If a single name follows the title, that one person is an *adviser* upon the subject. Fully organized committees are indicated by listed personnel and description of the work in hand.

COMMITTEE 1—BASIC WATER-WORKS DATA

ELSON T. KILLAM, *Adviser*

COMMITTEE 2—SURFACE WATER ALLOCATION

COMMITTEE 3—SURFACE WATER COLLECTION

COMMITTEE 4—GROUND WATER COLLECTION

DANIEL W. MEAD, *Adviser*

COMMITTEE 4A—DEEP WELLS AND DEEP WELL PUMPS

J. ARTHUR CARR, *Chairman*
STEPHEN M. DUNN
ALBERT G. FIEDLER
ROBT. W. HARDING
ANGUS D. HENDERSON
C. M. MCCORD
JAMES C. HARDING, *Co-Chairman*
W. W. MOREHOUSE
O. J. MUEGGE
MARCEL PEQUEGNOT
LEON A. SMITH
C. M. STANLEY

REEVES NEWSOM, *Adviser*

This committee has been assigned the duty of developing standard specifications for the construction and testing of deep wells, as well as the purchase requirements for, and method of testing deep well pumps. Details such as alignment, plumbness, casing materials, general safety considerations, sterilization, testing, etc., will be included in the well specifications. Specifications relating to the purchase and acceptance testing of pumps will outline the information which should be furnished to the manufacturer by the purchaser and which should be furnished by the purchaser to the manufacturer. They will also include methods of testing after installation for purposes of determining the degree of conformance to the specifications.

COMMITTEE 5—QUALITY AND TREATMENT

PAUL HANSEN, *Chairman*

A "Manual of Water Quality and Treatment" was published in April, 1940. This publication followed several years of organized activity of a series of subcommittees under the direction of Chairman Hansen. The text was organized for publication by the late Lewis V. Carpenter.

COMMITTEE 5A—HISTORY OF WATER PURIFICATION

MOSES N. BAKER, *Chairman*

Mr. Baker is conducting an extensive research in this country and abroad in the preparation of a record of the developments which have led up to modern water treatment.

COMMITTEE 5B—CHEMICAL HAZARDS IN WATER WORKS PLANTS

MARSDEN C. SMITH, *Chairman*
GEO. H. FENKELL
ARTHUR E. GORMAN
FRANK E. HALE
NORMAN J. HOWARD
LINN H. ENSLOW
H. H. GERSTEIN
RAY F. GOUDEY
L. L. HEDGEPETH
HAROLD S. HUTTON
WINFIELD S. MAHLIE

This committee is organized to study and report upon the methods of safe handling of chemicals used in water purification. It has published three reports: Chlorine—1935 (reprints 25¢ each); Ammonia—1936 (reprints 20¢ each); Sulfur Dioxide and Caustic Soda—1939 (reprints 20¢ each).

COMMITTEE 6—POWER AND PUMPING

C. B. BURDICK, *Adviser*

COMMITTEE 7—TRANSMISSION AND DISTRIBUTION

COMMITTEE 7A—STEEL PLATE PIPE

WM. W. HURLBUT, *Chairman*

Consumer Members

FRANK A. BARBOUR
WM. W. BRUSH
GEO. H. FENKELL
FRED MORSE RANDLETT
JOHN F. SKINNER
THOS. H. WIGGIN

Producer Members

RUSSELL E. BARNARD
GEO. B. MCCOMB
C. S. PATTON

This committee has prepared specifications for steel plate pipe and coatings as follows:—

7A.1-1940—A. W. W. A. Standard Specifications for Riveted Steel Pipe (15¢ a copy).

7A.2—*Tentative* A. W. W. A. Standard Specifications for Lock-Bar Pipe (15¢ a copy).

7A.3-1940—A. W. W. A. Standard Specifications for Electric Fusion Welded Steel Water Pipe of Sizes 30 Inches and Over.

7A.4—*Tentative* A. W. W. A. Standard Specifications for Steel Water Pipe of Sizes of 4 Inches up to, but not Including, 30 Inches (with 7A.3, 25¢ a copy).

7A.5-1940—A. W. W. A. Standard Specifications for Coal-Tar Enamel Protective Coatings for Steel Water Pipe of Sizes of 30 Inches and Over.

7A.6-1940—A. W. W. A. Standard Specifications for Coal-Tar Enamel Protective Coatings for Steel Water Pipe of Sizes of 4½ Inches Outside Diameter up to, but not Including, 30 Inches (with 7A.5, 30¢ a copy).

7A.7—*Tentative* A. W. W. A. Standard Specifications for Cement-Mortar Protective Coating for Steel Water Pipe of Sizes of 30 Inches and Over (20¢ a copy).

COMMITTEE 7B—REINFORCED CONCRETE PIPE

COMMITTEE 7C—CAST IRON PIPE

The work which would ordinarily be undertaken by this sub-committee is being carried on by Sectional Committee A21, on Specifications for Cast Iron Pipe, Thomas H. Wiggin, Chairman. This is a joint committee organized under the procedure established by the American Standards Association and on which the American Water Works Association is represented. This committee is listed under Joint Committees.

COMMITTEE 7D—LAYING CAST IRON PIPE

WM. C. MABEE, *Chairman*
CLINTON L. BOGERT
E. T. CRANCH
FRANK YOUNG DORRANCE
WM. W. HURLBUT
SAMUEL E. KILLAM
H. LLOYD NELSON
B. A. POOLE
GEO. W. PRACY
WM. M. RAPP
RALPH W. REYNOLDS
GEO. GRAHAM ROUTLEDGE
THOS. J. SKINKER
J. B. WINDER

This committee has prepared standard specifications for the laying of cast iron pipe, published in the JOURNAL for February, 1938 and adopted by the Board in April, 1938. Reprints of the report of this committee are available in separate form at the price of 15¢ per copy or 12¢ each in lots of 10 or more.

COMMITTEE 7E—ASBESTOS-CEMENT PIPE

A committee is in process of organization.

COMMITTEE 7F—VALVES, SLUICE GATES AND FIRE HYDRANTS

WM. R. CONARD, *Chairman*
WM. FLANNERY
HAROLD W. GRISWOLD
J. ARTHUR JENSEN
FRANK H. STEPHENSON

Specifications for Gate Valves prepared by this committee were adopted by the Board on April 28, 1938 and became effective May 1, 1939. Copies of these specifications are available for sale at a price of 15¢ per single copy and at a price of 10¢ per copy in lots of fifty or more.

Specifications for Fire Hydrants (now in press) were approved by the Board on January 17, 1940, to be effective November 1, 1940.

The committee has under consideration at the present time specifications for Sluice Gates.

COMMITTEE 7G—LOCATION RECORDS AND MAINTENANCE OF MAINS AND SERVICES

W. VICTOR WEIR, *Chairman*
WM. G. BANKS
ALBERT R. DAVIS
JOHN C. DETWEILER
ROGER W. ESTY
MAURICE N. GERARDY
HAROLD B. GOTAAS
BARD LIVINGSTONE
A. B. MANSON
FREDERICK OHRT
GEORGE TATNALL

The report of this committee was published in the JOURNAL for February, 1940. Reprints of the report are available for 25¢ per copy.

COMMITTEE 7H—STEEL STANDPIPES AND ELEVATED TANKS

LOUIS R. HOWSON, *Chairman*
H. O. HILL
J. O. JACKSON
C. W. OBERT
JOS. P. SCHWADA
N. T. VEATCH, JR.

Mr. Howson is also chairman of a similar committee of the American Welding Society. In addition to Mr. Howson, the members of that committee are:

H. C. BOARDMAN
J. O. JACKSON
C. W. OBERT
J. P. SCHWADA
H. A. SWEET

The report of this committee, offered as a joint specification by the A. W. W. A. and the American Welding Society was approved by the A. W. W. A.

Board of Directors on April 25, 1940, as a *tentative* standard specification The report is now in press.

COMMITTEE 7I—PIPE LINE COEFFICIENTS

Clinton L. Bogert, *Chairman*	George Norcom
H. G. Acres	Thos. J. Skinker
James E. Gibson	R. S. Weston
L. E. Goit	E. K. Wilson
Reeves Newsom	Thos. F. Wolfe

Established in 1936, at the suggestion of the New England Water Works Association, this committee's purpose is to cooperate with that association in the preparation of a report covering a wider geographic field than was covered in the report of the New England committee.

COMMITTEE 7J—DISTRIBUTION SYSTEM SAFETY

Wm. E. Stanley, *Chairman*	R. F. Goudey
A. E. Berry	J. Arthur Jensen
C. K. Calvert	W. R. LaDue
M. W. Cowles	F. A. Marston
F. M. Dawson	D. H. Maxwell
A. E. Gorman	L. F. Warrick

This committee has as its scope the definition of the structural and sanitary hazards which may be encountered in the distribution of public water supplies and the determination of reasonable means of obtaining structural safety and the elimination of sanitary hazards.

The committee shall consider water for public supply from the point of its delivery to the filtered water clear well (or its equivalent), through connecting conduits, pump suction wells (or reservoirs), high service pumps and stations, distribution reservoirs, standpipes or elevated tanks and the distribution mains up to the consumer's meter.

There are excepted from the scope of the committee's activities the following topics: Power and pumping economics; specifications for steel pipe; specifications for cast-iron pipe and fittings; specifications for reinforced concrete pipe; specifications for laying cast iron pipe; specifications for valves and hydrants; specifications for asbestos-cement pipe; specifications for standpipes and elevated tanks; specifications for service line materials; specifications for meters; location records of mains and services; and methods of control of cross-connections.

COMMITTEE 7K—CROSS-CONNECTIONS

E. Sherman Chase, *Chairman*	Earl Devendorf
J. Walter Ackerman	H. E. Halpin
O. E. Brownell	J. Arthur Jensen
Joel I. Connolly	W. Scott Johnson
M. W. Cowles	W. J. Scott
F. M. Dawson	

This committee was organized for the purpose of correlating information concerning the control of cross connections. A report was published in the JOURNAL for March, 1933. Further studies are now in progress.

COMMITTEE 7L—FIRE PREVENTION AND PROTECTION

CHAS. J. ALFKE, *Chairman*
J. WALTER ACKERMAN
PHILIP BURGESS
CARLETON E. DAVIS
THAD M. ERWIN
HARRY U. FULLER
D. D. GROSS
L. W. HELMREICH
LOUIS R. HOWSON
FRANK C. JORDAN
DALE L. MAFFITT
CALEB MILLS SAVILLE
JACOB SCHWARTZ
LEON A. SMITH
WM. STORRIE

This committee is charged particularly with:

1. The promotion of an understanding on the part of water-works men, as well as on the part of the public, of the effect that fire protection facilities have upon the total amount of capital invested in public water supply projects.

2. Encouragement of the development of rational water rate structures which take into account the amount which should accrue in payment for fire protection.

3. The development of an understanding of a reasonable basis of charges for private fire protection and defense against unreasonable attacks upon these charges.

COMMITTEE 7M—METERS

S. F. NEWKIRK, *Chairman*
EDW. V. BUCHANAN
JAMES G. CARNS
A. P. KURANZ
H. W. NIEMEYER
H. V. PEDERSEN
GEO. READ
GEO. J. ROHAN
L. S. VANCE
W. VICTOR WEIR

This committee has under final consideration at the present time, the fourth revision of the text of a proposed specification for displacement meters.

COMMITTEE 7N—ELECTROLYSIS AND ELECTRICAL INTERFERENCE

M. WARREN COWLES
CHAS. F. MEYERHERM (*Sec'y. to Com.*)
EDW. E. MINOR

This committee has been working on problems in connection with the electrolysis of water pipes, and in particular, on questions concerning the use of water pipes as a means of grounding electrical systems.

COMMITTEE 7S—SERVICE LINE MATERIALS

WALTER A. PEIRCE, *Chairman*
FRANK C. AMSBARY, JR.
PAUL D. COOK
JOHN C. DETWEILER
DWIGHT D. GROSS
E. E. JACOBSON

R. H. MARTINDALE
C. D. MOON
REEVES NEWSOM
H. V. PEDERSEN
GEO. W. PRACY
EDW. H. RUEHL
F. ALBERT SCHAEFER
R. J. SMITH
STEPHEN H. TAYLOR

This committee is charged with the review and recommendation for publication of specifications for copper, iron (wrought or cast), lead (etc.) tubing or pipe in sizes and weights suitable for water service lines.

The committee may also, to a limited extent, review and summarize current methods of installation of service lines.

COMMITTEE 8—VALUATION AND DEPRECIATION

COMMITTEE 9—RATES

COMMITTEE 10—WATER CONSUMPTION

WATER PURIFICATION DIVISION COMMITTEES

COMMITTEE ON SPECIFICATIONS AND TESTS FOR WATER PURIFICATION CHEMICALS

MATHEW M. BRAIDECH, *Chairman*
R. C. BARDWELL
WILLIAM U. GALLAHER
GILBERT L. KELSO
WARREN A. KRAMER
WINFIELD S. MAHLIE
GEORGE R. SPALDING

This committee is charged with the preparation of standard specifications for chemicals used in water treatment and standard methods of analysis and/or acceptance testing of such materials. The committee may develop analytical and testing methods or it may, if it elects, accept for the A. W. W. A. (as standard) methods of analysis and/or testing which have been developed by other organizations. Excluded from the scope of this committee are specifications and testing methods for treatment materials not consumed by single use, such as granular activated carbon and zeolites.

COMMITTEE ON ACTIVATED CARBON RESEARCH

MATHEW M. BRAIDECH, *Chairman*
LLOYD C. BILLINGS
LOUIS B. HARRISON
JOHN W. HASSLER
W. A. HELBIG
ROBERTS HULBERT
NEIL KERSHAW
R. W. ROWLEY
C. H. SPAULDING
W. J. VAN REENEN
PAUL WEIR
G. E. WILLCOMB

This committee succeeded the committee on "Specifications and Tests for Powdered Activated Carbon" after the acceptance and publication of that committee's report (July, 1938). Its duty is to promote, coordinate and report upon research regarding quality and uses of activated carbon in water treatment. Its field of interest includes both powdered and granular activated carbon.

COMMITTEE ON SPECIFICATIONS FOR AND METHODS OF TESTING ZEOLITES

D. E. Davis, *Chairman*
George D. Norcom
H. M. Olson
Sheppard T. Powell

This committee succeeds the committee set up to develop specifications for base-exchange zeolites. Its duty is the development of specifications for and methods of acceptance testing of base and acid exchange type zeolites.

COMMITTEE ON METHODS OF DETERMINING FLUORIDES

A. P. Black, *Chairman*
W. D. Collins
R. F. Goudey
Paul D. Haney
M. Starr Nichols
R. D. Scott
H. V. Upton
J. G. Weart
L. V. Wilcox

This committee is carrying on cooperative research covering the various methods of determination of fluorides in water and will make a recommendation for selection of preferred methods.

COMMITTEE ON CHLORAMINATION

F. Wellington Gilcreas, *Chairman*
C. K. Calvert
Harry Faber
H. H. Gerstein
A. E. Griffin
Max Levine, *Adviser*
Walter L. Mallmann, *Adviser*

The duty of this committee is to review methods of applying chlorine and ammonia in combination for water treatment, appraisal of the nature of the process and results obtained therefrom.

COMMITTEE ON METHODS OF WATER TREATMENT AND LABORATORY CONTROL

George D. Norcom, *Chairman*
Chas. R. Cox
Max Levine
Arthur Mellen
W. M. Wallace
L. F. Warrick

The duty of this committee is (1) the investigation of any process or method of water treatment and/or the laboratory evaluation thereof not otherwise definitely assigned to other committees, to the end that the value or lack of value of the process or method be definitely understood; (2) a study of obscure intestinal outbursts which, due to the present lack of full epidemiological knowledge, may be ascribed to deficiencies in hygienic quality of the public water supply; (3) the resistance of bacteria to water purification processes; and (4) the deterioration in bacterial quality of water passing through water distribution systems. (Excluded from the scope of this committee are the projects specifically assigned to the other committees of this Division).

COMMITTEE ON WATER CONDITIONING METHODS TO INHIBIT CORROSION

W. F. Langelier, *Chairman*
Carl Alexander
G. E. Arnold
Frank E. Hale
C. P. Hoover
Edw. W. Moore
Thos. H. Wiggin
E. K. Wilson
G. E. Willcomb

The duty of this committee is the investigation of current treatment processes available for the purpose of eliminating or inhibiting corrosivity of public water supplies. The committee coordinates its work with studies in progress under direction of the Committee on "Pipe Line Coefficients."

COMMITTEE ON STANDARDS FOR PURIFICATION PLANT OPERATION

Edw. S. Hopkins, *Chairman*
L. J. Alexander
John R. Baylis
L. C. Billings
Thomas A. Cole
William U. Gallaher
H. R. Hall
L. A. Marshall
George D. Norcom
George B. Prindle
Robt. S. Weston
Abel Wolman

The duty of this committee is the development of minimum desirable standards for operating control and measurement of hygienic efficiency of water treatment plants. It includes the outline of tests and limiting efficiency values desired for various types of water treatment and varying population served.

COMMITTEE ON SPECIFICATIONS FOR FILTERING MATERIAL

Paul Hansen, *Chairman*

This is a new committee that is now being organized. Other members are to be selected. The duty of the committee is the development of specifications for and methods of acceptance testing of filter gravel and sand. Its report may include suggested limiting sizes and characteristics required for different types of treatment and rates of flow.

COMMITTEE ON PERMISSIBLE LOADINGS AND CAPACITIES OF WATER TREATMENT PLANTS

A. Clinton Decker, *Chairman*

This committee is in process of organization. To it will be assigned consideration of the applicability of short-term sedimentation and high-rate filtration to water treatment processes.

FINANCE AND ACCOUNTING DIVISION COMMITTEES

COMMITTEE ON JOINT ADMINISTRATION AND COLLECTION OF WATER AND SEWER ACCOUNTS

L. N. THOMPSON, *Chairman*
R. A. ALLTON
L. G. LENHARDT
WM. PIATT
W. F. TEMPEST
J. B. WINDER

The duty of this committee includes collection of information concerning joint administrative and collection policies and recommendations of procedure or methods.

COMMITTEE ON LIEN LAWS

H. L. MEITES, *Chairman*
L. G. LENHARDT
JACOB SCHWARTZ

The duty of this committee includes a review of existing state laws and municipal ordinances relating to collection of water bills by application of liens to property and recommendations concerning policies and procedures.

JOINT COMMITTEES WITH OTHER ORGANIZATIONS

JOINT EDITORIAL COMMITTEE ON STANDARD METHODS FOR THE EXAMINATION OF WATER AND SEWAGE

American Public Health Association

American Water Works Association

Representatives of A. W. W. A.

WILLIAM D. HATFIELD
HARALD A. LEVERIN
M. C. SCHWARTZ

Representatives of A. P. H. A.

ARTHUR M. BUSWELL
WALTER L. MALLMANN
JOHN F. NORTON, *Chairman*

This committee performs the editorial work and makes all arrangements for the publication of the book "Standard Methods for the Examination of Water and Sewage." An eighth edition of this book was issued in 1936. The ninth edition of this text is now in preparation.

JOINT RESEARCH COMMITTEE ON BOILER FEEDWATER STUDIES

American Boiler Manufacturers Association; Association of American Railroads; American Society of Mechanical Engineers; American Society for Testing Materials; American Water Works Association; and Edison Electric Institute.

Representatives of A. W. W. A.

HARRY E. JORDAN
SHEPPARD T. POWELL

This committee plans and controls research on certain problems associated with boiler feedwater.

The secretary is J. B. Romer, Chief Chemist, The Babcock & Wilcox Co., Barberton, Ohio. An executive sub-committee and nine technical sub-committees have been arranged.

AMERICAN COORDINATING COMMITTEE ON CORROSION

Representatives of A. W. W. A.

W. F. Langelier
H. Lloyd Nelson, *alternate*

This committee includes representatives of twenty associations. It is organized for the purpose of correlating research regarding corrosion. The chairman is F. N. Speller. The secretary is Geo. H. Young, 4400 Fifth Ave., Pittsburgh, Penna.

JOINT COMMITTEE ON CONSTRUCTION CONTRACTS

Representative of A. W. W. A.

L. G. Lenhardt

This committee is engaged in a review and revision of the standard form of construction contract. The work is under the guidance of the Associated General Contractors of the U. S.

AMERICAN RESEARCH COMMITTEE ON GROUNDING

American Water Works Association—Edison Electric Institute.

Representatives of A. W. W. A.

M. Warren Cowles
Charles F. Meyerherm
Edward E. Minor

This committee has been formed in order to investigate and report upon the various questions involved in the grounding of electrical circuits on water, gas and drainage piping. The general chairman of this committee is H. S. Warren, Bell Telephone Laboratories, 463 West Street, New York, N. Y. The secretary-treasurer is C. F. Meyerherm.

COMMITTEE ON WATER WORKS TERMS

American Public Health Association; American Society of Civil Engineers; and American Water Works Association.

Thorndike Saville, *General Chairman*

Representatives of A. P. H. A.

Earle B. Phelps*
Sol Pincus
Ralph E. Tarbett

Representatives of A. S. C. E.

H. Burdett Cleveland*
O. E. Brownell
John B. Hawley

*Sub-Chairman.

Representatives of A. W. W. A.

THORNDIKE SAVILLE*
HAROLD E. BABBITT
SAMUEL B. MORRIS

* Sub-Chairman.

This committee has been organized to formulate the definitions of various terms used in the practice of water works engineering and operation. A preliminary report is now being reviewed.

COMMITTEE ON WATER WORKS ACCOUNTING MANUAL

American Water Works Association—Municipal Finance Officers' Association.

Representatives of A. W. W. A.

J. C. FLANAGAN
M. F. HOFFMAN
HAL F. SMITH

Representatives of M. F. O. A.

Not yet appointed

The establishment of a joint editorial and review committee has been agreed upon, with the intention of making such committee responsible for preparation of future editions of the *Manual of Water Works Accounting*, which document was first published in 1938.

JOINT COMMITTEE ON WATER HAMMER

Representatives of A. W. W. A.

F. M. DAWSON
L. H. KESSLER

This committee was organized in 1931 under the Hydraulic Division of the A. S. M. E. Mr. S. Logan Kerr is its general chairman. A symposium on water hammer was presented in 1933. A second symposium on the subject was held at the December, 1937 meeting of A. S. M. E. The committee has a very broad international representation.

A. W. W. A. REPRESENTATIVES ON COMMITTEES OF OTHER ORGANIZATIONS

U. S. BUREAU OF STANDARDS

SIMPLIFIED PRACTICE COMMITTEES ON WROUGHT IRON AND WROUGHT STEEL PIPE, VALVES AND FITTINGS

Representative of A. W. W. A.

SHEPPARD T. POWELL

COMMITTEES UNDER THE PROCEDURE OF THE AMERICAN STANDARDS ASSOCIATION

A21—CAST IRON PIPE AND SPECIAL CASTINGS, SPECIFICATIONS FOR

Sponsors—American Gas Association; American Society for Testing Materials; American Water Works Association; and New England Water Works Association.

Representatives of A. W. W. A.

THOMAS H. WIGGIN, *General Chairman*
FRANK A. BARBOUR
WILLIAM W. BRUSH
L. G. LENHARDT
REEVES NEWSOM

As noted above, T. H. Wiggin (A.W.W.A.) is the general chairman of the committee. The secretary is C. C. Simpson, Jr., (Am. Gas Assn.), 4 Irving Place, New York, N. Y.

A series of specification documents have been prepared by the committee and are now A.S.A. Standard:—

A21.1-1939—Manual for the Computation of Strength and Thickness of Cast Iron Pipe (40¢ a copy).
A21.2-1939—Specifications for Cast-Iron Pit Cast Pipe for Water or Other Liquids (20¢ a copy).
A21.4-1939—Specifications for Cement Mortar Lining for Cast Iron Pipe and Fittings (15¢ a copy).

A35—MANHOLE FRAMES AND COVERS

Sponsors—American Society of Civil Engineers and The Telephone Group (Bell System and U. S. Ind. Tel. Assn.).

Representative of A. W. W. A.

FRANK A. MARSTON

This committee is coöperating with the Division of Simplified Practice (U. S. Dept. of Commerce) in the standardization of design, material and dimensions of manhole frames and covers. The general chairman is L. B. Fish, (Bell System) 195 Broadway, New York, N. Y.

A40—PLUMBING EQUIPMENT, STANDARDIZATION OF

Sponsors—American Society of Mechanical Engineers and American Society of Sanitary Engineers.

Representative of A. W. W. A.

M. WARREN COWLES

The general chairman of this committee is W. C. Groeniger, (A. S. S. E.) 3250 A. I. U. Citadel, Columbus, Ohio.

B2-1919—PIPE THREAD

Sponsors—American Gas Association and American Society of Mechanical Engineers.

Representative of A. W. W. A.

WILLIAM W. BRUSH

The general chairman of this committee is Alten S. Miller (A. G. A.), 80 Westcott Rd., Princeton, N. J.

B16—PIPE FLANGES AND FITTINGS

Sponsors—American Society of Mechanical Engineers; Heating, Piping and Air Conditioning Contractors National Association; and Manufacturers Standardization of the Valve and Fittings Industry.

Representatives of A. W. W. A.

FRANK A. BARBOUR

WILLIAM W. HURLBUT

The general chairman of this committee is Collins P. Bliss (A. S. M. E.), New York University, New York, N. Y.

B31—PRESSURE PIPING, CODE FOR

Sponsor—American Society of Mechanical Engineers.

Representative of A. W. W. A.

H. ARTHUR PRICE

The general chairman of this committee is Edwin B. Ricketts, New York Edison Co., New York, N. Y.

B36—DIMENSIONS AND MATERIALS OF WROUGHT IRON AND WROUGHT STEEL PIPE AND TUBING, STANDARDIZATION OF

Sponsors—American Society of Mechanical Engineers and American Society for Testing Materials.

Representative of A. W. W. A.

H. ARTHUR PRICE

The general chairman of this committee is Harold H. Morgan (A. S. T. M.), 2200 Insurance Exchange Bldg., Chicago, Ill.

C1—NATIONAL ELECTRICAL CODE

Sponsor—National Fire Protection Association.

Representative of A. W. W. A. on Sub-Committee on Grounding

CHARLES F. MEYERHERM

The general chairman of this committee is A. R. Small, 109 Leonard St., New York, N. Y.

G8—ZINC COATING OF IRON AND STEEL, SPECIFICATIONS FOR

Sponsor—American Society for Testing Materials.

Representatives of A. W. W. A.

SHEPPARD T. POWELL

The general chairman of this committee is J. A. Capp (A. S. T. M.), General Electric Co., Schenectady, N. Y.

Z23—SIEVES FOR TESTING PURPOSES, SPECIFICATIONS FOR

Sponsors—American Society for Testing Materials and Bureau of Standards (U. S. Dept. of Commerce).

Representative of A. W. W. A.

GORDON M. FAIR

The general chairman of the committee is L. T. Work (A. S. T. M.), Columbia University, New York, N. Y.

Z32—STANDARDIZATION OF GRAPHICAL SYMBOLS FOR USE ON DRAWINGS

Sponsors—American Institute of Electrical Engineers and American Society of Mechanical Engineers.

Representative of A. W. W. A.

W. VICTOR WEIR

The general chairman of this committee is H. W. Samson (A. I. E. E.), General Electric Co., Schenectady, N. Y.

COMMITTEES OF THE NATIONAL FIRE PROTECTION ASSOCIATION

ELECTRICAL CODE COMMITTEE

See Committee C1 of the American Standards Association, above. These are identical committees.

COMMITTEE ON FORESTS

Representative of A. W. W. A.

EDWARD E. MINOR

Fire protection and prevention for summer homes in forested areas.

COMMITTEE ON HYDRANTS, VALVES AND PIPE FITTINGS

Representative of A. W. W. A.

FRANK A. BARBOUR

COMMITTEE ON PUBLIC WATER SUPPLIES FOR PRIVATE FIRE PROTECTION

Representative of A. W. W. A.

C. J. ALFKE

Including the uniform marking of fire hydrants.

COMMITTEE ON TANKS

Representative of A. W. W. A.

LOUIS R. HOWSON

A. S. T. M. COMMITTEE ON SULFUR CEMENTS

Representative of A. W. W. A.

JOSEPH P. SCHWADA

NATIONAL ASSOCIATION OF RAILROAD AND UTILITIES COMMISSIONERS' COMMITTEES ON CLASSIFICATION OF ACCOUNTS, ETC.

Representative of A. W. W. A.

LOUIS D. BLUM

ADVISORY COMMITTEE TO THE NEW YORK CITY BOARD OF HEALTH

Representative of A. W. W. A.

THOMAS M. RIDDICK

AMERICAN WATER WORKS ASSOCIATION

CONSTITUTION AND BY-LAWS

AMERICAN WATER WORKS ASSOCIATION
22 E. 40th St., New York, N. Y.

CONSTITUTION AND BY-LAWS
OF
THE AMERICAN WATER WORKS ASSOCIATION

(Adopted June 25, 1929, and with amendments to September 1, 1938)

CONSTITUTION

ARTICLE I

NAME

The name of this Association shall be—The American Water Works Association.

(Constitution)

ARTICLE II

The object of this Association shall be the advancement of knowledge of the design, construction, operation and management of water works, and its membership shall consist of persons interested in such matters, having such qualifications and classifications as shall be from time to time prescribed in the By-Laws.

(Constitution)

ARTICLE III

BOARD OF DIRECTORS

SECTION 1. The Governing Body of the Association shall be a Board of Directors, hereinafter called the Board.

SECTION 2. The Board shall consist of:

a. The President of the Association.

b. The Vice-President of the Association.

c. The Treasurer of the Association.

d. One Director to be elected by each Section of the Association.

e. Three Directors to be elected by the Members of the Water Works Manufacturers Association.

f. The latest living Past President of the Association.

g. The Chairman of the Committee on Water Works Practice.

h. The Chairman of the Publication Committee.

SECTION 3. The terms of Directors and Officers shall start at the beginning of the last day of the annual convention at which they are elected, and shall terminate at the beginning of the last day of the annual convention at the expiration of their terms.

SECTION 4. The President of the Association, the Vice-President of the Association and the Directors elected by the Sections of the Association and by the Water Works Manufacturers Association will not be eligible for reëlection for consecutive terms.

SECTION 5. The Officers of the Association shall be the Officers of the Board.

SECTION 6. The functions of the Board shall include the following:

a. Establishing policies for the Association, and for the Executive Committee, and for the Officers.

b. Providing for the general administration of the affairs and property of the Association.

c. Fixing the time and place of the annual and other conventions of the Association as provided in the By-Laws.

d. Preparing and enforcing for the conduct of the business of the Association, By-Laws not in conflict with this Constitution, and amending the same.

SECTION 7. A quorum of the Board shall consist of a majority of its members.

SECTION 8. Regular meetings of the Board shall be held during the annual convention of the Association, on such days as may be decided by the Board. Other meetings may be held at the direction of the President, or at the request, in writing, of five members of the Board, and on such notice as shall be provided in the By-Laws.

(*Constitution*)

ARTICLE IV

NOMINATION AND ELECTION OF OFFICERS AND DIRECTORS

SECTION 1. There shall be a meeting of the Board held in January of each year at which a Nominating Committee consisting of the Directors representing the various Sections of the Association shall meet under the Chairmanship of the President, and shall nominate one, and may nominate two candidates for each of the offices of President, Vice-President, and Treasurer, provided that any candidate so nominated shall be an Active Member of the Association, and shall have been a member of the Executive Committee prior to the adoption of the present Constitution and By-Laws, or a member of

the Board of Directors since its adoption, and shall signify willingness to accept the nomination. This Committee shall report its list of nominees to the Board before the close of its January meeting, and the list shall then be mailed to the membership before February first of that year.

At any time prior to noon on the first day of March of each year additional nominations may be made by request to the Secretary, signed by at least twenty-five Active Members, and upon receipt of such request, the Secretary shall, after acceptance of the nomination by the candidates, add such names to the ballot prepared by him. The nominees of the Nominating Committee shall be so designated on the ballot for each office, and the names of all nominees shall be arranged in alphabetical order.

When more than one name is nominated for either office, the election shall be by letter ballot. Each Active Member shall be entitled to vote for one candidate for the office of President, one candidate for the office of Vice-President, and one candidate for the office of Treasurer. The ballot shall be prepared by the Secretary and mailed to each Active Member of the Association prior to April first in each year, and shall state the name and residence of each candidate.

The ballot shall be sealed separately in a special ballot envelope, and the latter shall be enclosed in a larger envelope, and mailed to the Secretary. The signature of the member voting shall appear on the outer envelope.

When a letter ballot is necessary, the Secretary together with two or more Tellers appointed by the President shall meet at a time and place directed by the President, and shall open and count all ballots cast by persons entitled to vote. No ballot shall be counted if received later than noon of the seventh day previous to the beginning of the annual convention of the Association. When only one candidate is placed in nomination for each office to be filled, the report of the Nominating Committee shall be considered as an election.

The report of the Tellers for the election of the incoming President, Vice-President, and Treasurer shall be declared by the President at the annual convention on certificates of the Tellers. The candidates who shall have received the highest number of votes cast for the several offices shall be declared elected. If there be a tie vote the President shall order a ballot to be taken at the annual convention to decide which of the candidates who have received the same number of ballots shall be chosen.

The terms of the Officers so elected shall be for one year beginning with the last day of the annual convention at which they are elected to the beginning of the last day of the next annual convention, or until their successors shall have been chosen.

In case of a vacancy in the office of President, the Vice-President shall act in his place for the unexpired term. In case the Vice-President cannot act, the latest living Past President shall do so.

In the case of a vacancy in the office of Treasurer, the Executive Committee shall appoint an Active Member to fill the office for the unexpired term.

SECTION 2. One Director to represent each Local Section shall be nominated and elected by the members of the Section at an annual Section meeting, and in the same manner as the Presiding Officer of that Section is elected. The manner of such election shall receive the approval of the Board. The Director so elected shall be an Active Member and shall reside in the territory of the Section at the time of his election. Should he cease to reside in the territory of the Section before his term of office is ended, it shall be within the power of the Section to replace him.

The term of each Director so elected shall be for three years beginning with the last day of the annual convention immediately following his election, except that when a new Local Section is constituted, the initial term of the Director representing such Section shall be determined by the Board.

In the case of the retiring, from any cause, of a Director representing a Section, before his term is completed, the governing body of the Section shall designate his successor, who shall serve for the unexpired portion of the term.

SECTION 3. Three Directors shall be nominated and elected by the Water Works Manufacturers Association. The term of each Director shall be for three years beginning with the last day of the annual convention immediately following his election, except as stated below:

The present Director representing the Water Works Manufacturers Association shall continue in office until the last day of the 1936 annual convention.

One Director shall be elected to hold office until the last day of the 1937 annual convention.

One Director shall be elected to hold office until the last day of the 1938 annual convention.

These Directors shall take office immediately following their election.

In the case of the retiring, from any cause, of a Director representing the Water Works Manufacturers Association, before his term is completed, the governing body of the Water Works Manufacturers Association shall designate his successor, who shall serve for the unexpired portion of the term.

(*Constitution*)

ARTICLE V

The Executive Committee and Officers as constituted under the previous Constitution shall remain in office, and continue to direct the affairs of the Association until the end of the annual convention in 1930.

The nominations and elections as laid down in the Constitution and By-Laws, accepted by the Association at its annual convention in 1929, shall proceed prior to the annual convention in 1930, and the successful candidates shall take office at the close of the latter convention.

Except as mentioned above the Constitution shall take effect at the end of the annual convention in 1929.

(*Constitution*)

ARTICLE VI

Amendments

Proposals to amend this Constitution shall be submitted in writing to the Board, signed by at least ten Active Members of the Association.

The Board shall consider the proposals and the proposers shall be notified of the Board's opinion in regard thereto not later than the first day of March.

The proposers may then withdraw their proposals, accept any change suggested, or insist on the original form, sending their decision to the Secretary not later than the first day of April.

The proposals, as accepted by the proposers, shall be mailed to the Active Members not less than twenty-one days before the annual convention.

Proposals to amend this Constitution may also be made by the Board and shall be mailed to the Active Members not less than twenty-one days before the annual convention.

All proposals shall be submitted for discussion at the annual convention.

The Active Members there present may propose an amendment or amendments thereto, and all proposals together with any such amendment or amendments shall be printed on a letter ballot to be submitted to the Active membership.

The Secretary shall issue the letter ballot not later than two months after the annual convention.

On the written request of three or more members the letter ballot shall be accompanied by a statement giving reasons for and against the proposal edited by a Committee appointed by the Board, consisting of an equal number of members favoring and members opposing the proposal.

The letter ballot shall be returnable to the Secretary not later than three months after the annual convention. Three Tellers appointed by the Board shall forthwith count the ballots and report the result to the Board.

An affirmative two-thirds vote of all valid ballots shall be necessary for the amendment or repeal of any part of the Constitution.

The amendments as passed shall take effect at the beginning of the next calendar year except that changes affecting the tenure of office of an Officer of the Association shall not take effect until the next annual convention.

BY-LAWS

ARTICLE I

MEMBERSHIP

SECTION 1. The membership of the Association shall consist of Honorary, Active, Corporate, Associate, Junior Members and Affiliates.

SECTION 2. An Honorary Member shall be one whose practical or scientific knowledge in matters relating to water supply, and whose accomplishments in that field of endeavor shall entitle him to special recognition by the Association. Honorary Members shall have the same privileges as Active Members but shall not be required to pay any dues for the support of the Association.

SECTION 3. An Active Member shall be a superintendent, a manager, an official or employee of a municipal or private water works; a civil, mechanical, hydraulic, or sanitary engineer, a chemist, a bacteriologist, or any qualified person engaged or interested in the advancement of knowledge relating to water supplies.

SECTION 4. A Corporate Member shall be a Water Board, Water Commission, Water Department, Water Company or Corporation, National, State or District Board of Health, or other body, corporation or organization engaged or interested in water supply work, and shall be entitled to one representative whose name shall appear on the roll of members and who shall have all the rights and privileges of an Active Member. This representative may be changed at the convenience and pleasure of the Corporate Member on written notice to the Secretary.

SECTION 5. An Associate Member shall be either a person, firm or corporation engaged in manufacturing or furnishing supplies for the operation, construction, or maintenance of water works.

SECTION 6. A Junior Member shall be an employee of a municipal or private water works; a civil, mechanical, hydraulic, or sanitary engineer, a chemist, a bacteriologist, a student or any otherwise qualified person engaged or interested in the advancement of knowledge relating to water supplies. At the time of his admission he shall be not less than eighteen years of age. His connection with the Association shall cease when he becomes twenty-five years of age, unless he is regularly enrolled as a student in a university or has previously transferred to the grade of Active Member. Junior Members shall receive the Journal and all privileges of Active membership except holding office and voting.

SECTION 7. An Affiliate shall be any person otherwise qualified for Active membership who, at the time of application, is not nor previously has been a member of the Association, and who, for acceptable reasons, does not wish to become an Active Member.

No corporation, firm or partnership which otherwise would be entitled to the grades of Associate or Corporate member may hold the grade of Affiliate. No employee of an Associate member may become an Affiliate. No person who is the Superintendent, the Manager, the Chief Engineer, the Superintendent of Filtration, the Chief Chemist or the Superintendent of Distribution in a plant having more than 3,000 active services, is eligible for the grade of Affiliate. Under unusual conditions, exception to the above may be made by action of the Executive Committee if the applicant sets forth fully the reasons for the exception when applying for the Affiliate grade.

Affiliates shall not be entitled to vote upon general association questions, and not eligible to hold office in the Association, nor in any of its Divisions. They shall be eligible to vote upon Section questions and to hold Section offices except those of Chairman, Vice-Chairman, Secretary (and/or Treasurer). They shall be entitled to all other rights and privileges of Active Members.

(*By-Laws*)

ARTICLE II

ADMISSION AND EXPULSION

SECTION 1. The Board, on its own initiative, or at the request of twenty-five members of the Association, may elect any qualified person an Honorary Member. This election shall take place at a regular meeting of the Board and shall be by ballot. Two negative ballots shall exclude.

Each Honorary Member shall receive an engrossed certificate of membership in that grade.

SECTION 2. Applications for Active, Corporate, Associate, or Junior membership and for the Affiliate grade shall be made on the blank forms provided by the Association. Each application shall embody a concise statement of the applicant's qualification for membership. All applications shall be forwarded to the Secretary who shall submit them to the Board.

An affirmative vote of a majority of the Board shall elect and the

applicant shall become a member when his annual dues shall have been paid.

Affiliates may transfer to the grade of Active Member by application therefor and upon approval of the Secretary.

SECTION 3. No member whose dues are in arrears for four months shall receive the publications of the Association until such arrears are paid. Members in arrears for one year shall be automatically dropped by the Secretary from the list of members.

SECTION 4. The Board may, for sufficient cause, temporarily or permanently excuse from the payment of annual dues, any member who from ill health, advanced age, or other good reason, is unable to pay such dues, and the Board may remit the whole or part of dues in arrears, or accept in lieu thereof desirable additions to the library or collections.

SECTION 5. A member who has been dropped for non payment of dues may be re-instated by the Board on payment of the arrears. He shall then be entitled to receive such back numbers of the publications of the Association as may have been withheld from him on account of non payment of dues, and are available for distribution.

SECTION 6. Any member of any grade may be expelled from membership in the Association, by a three-quarters vote of the Board, taken by letter ballot, provided such member has been given a written statement of the charges preferred, and has been accorded an opportunity of a hearing before the Board.

SECTION 7. Any member may retire from membership by giving written notice to the Secretary, provided that he is in good standing.

(*By-Laws*)

ARTICLE III

FEES AND DUES

SECTION 1. Each Active Member shall pay annual dues of ten dollars, provided that any Active Member in good standing who has paid dues continuously for thirty years shall be exempt from payment of further dues. No initiation fee shall be required from a member in good standing of an Affiliate Association or Society, who has been elected as an Active Member.

SECTION 2. Each Corporate Member shall pay annual dues of fifteen dollars.

SECTION 3. Each Associate Member shall pay annual dues of twenty-five dollars.

SECTION 4. Each Junior Member shall pay annual dues of five dollars.

SECTION 5. Each Affiliate shall pay annual dues of four dollars.

SECTION 6. The fiscal year of the Association shall begin on January first, and terminate on December thirty-first. Annual dues shall be payable in advance, and shall be due on January first in each year. It shall be the duty of the Secretary to notify each member on or before December thirty-first in each year of the amount due from said member for the ensuing year.

SECTION 7. Any newly elected member shall be entitled to all of the publications of the Association that are distributed to its members during the year, or that part of the year, for which he has paid dues.

Affiliates shall receive all publications to which the members are entitled except that they shall receive four issues only of the Journal per year.

(*By-Laws*)

ARTICLE IV

EXECUTIVE COMMITTEE

There shall be an Executive Committee of five members consisting of the President and four Directors. This Committee shall be chosen by the Board at its meeting at the annual convention.

The President of the Association shall act as Chairman of the Committee, or in his absence, the Committee shall choose a temporary Chairman from its members, and the Secretary of the Association shall act as its Secretary.

The duties of the Committee shall be to direct the administrative work of the Association and to carry out the policies of the Board between meetings of the latter.

A quorum of the Committee shall consist of three members.

(*By-Laws*)

ARTICLE V

DUTIES OF OFFICERS AND DIRECTORS

SECTION 1. The President shall have general supervision of the affairs of the Association, and shall preside at all conventions of the Association and meetings of the Board. In his absence he shall designate a Presiding Officer to act in his stead at such conventions or meetings. He shall be, ex-officio, a member of all Committees.

SECTION 2. The Vice-President shall assist the President in the performance of his duties, and act in his stead when required. He shall be, ex-officio, a member of all Committees.

SECTION 3. The Board of Directors shall be the legal representatives of the Association, and as such shall have full control of the Association in regular convention. It shall make the necessary arrangements for the conventions, and shall have power to expend the funds of the Association, or to invest the same, but must not incur indebtedness beyond the funds in the hands of the Treasurer and Secretary. It shall hold a meeting during the last day, and also a meeting at least one hour before the opening session of each annual convention. Other meetings shall be held at the call of the President, or of any five members of the Board. Notice of all meetings shall be issued by the Secretary at least ten days in advance of such meetings to all members of the Board.

At its meeting on the last day of the annual convention, the Board shall appoint a Secretary and an Editor which Officers shall serve until the close of the next annual convention, or until their successors shall have been appointed.

Except as otherwise provided in the Constitution and By-Laws, all questions before the Board shall be decided by a majority vote.

SECTION 4. The Treasurer shall have charge of the funds of the Association, and shall pay bills against the Association when certified by himself and the Secretary. He shall make a report of the expenditures and of the funds of the Association at the annual convention. He may, with the approval of the Board, establish a drawing account for the Secretary.

He shall be bonded at the expense of the Association, and to an amount to be determined by the Board.

He shall perform such other duties as may be assigned to him by the Board.

SECTION 5. The Secretary shall be an Active Member of the Association. It shall be his duty to attend all conventions and meetings of the Association, and of the Board, prepare the business and duly record the proceedings thereof. He shall see that all moneys due the Association are collected, and shall promptly deposit the same to the credit of the Association. He shall certify to all bills against the Association, and once each month he shall forward to each member of the Board, a financial summary of receipts and disbursements.

He shall, at the annual convention, make a report of the receipts and of the condition and affairs of the Association.

He shall have charge of the books and records of the Association and shall supervise the work of all employees.

The books of the Association shall be audited annually by Certified Public Accountants, to be appointed by the Board.

He shall be bonded at the expense of the Association, and to an amount to be determined by the Board.

He shall perform such other duties as shall be assigned to him by the Board.

SECTION 6. The Editor shall have charge of the printing and distribution to all the members of the Proceedings and Transactions of the Association, and shall perform such other duties as shall be assigned to him by the Board. He shall be, ex-officio, a member of the Publication Committee, and of the Committee on Water Works Practice.

(*By-Laws*)

ARTICLE VI

CONVENTIONS OF THE ASSOCIATION

The annual convention of the Association shall be held at a time and place to be selected by the Board. Additional conventions of the Association may be held at such times and places as may be selected by the Board. Meetings of the Sections shall be held as determined by the Constitutions of the Sections. All conventions and meetings shall be conducted according to "Roberts Rules of Order."

Each member and guest present at any of the conventions of the Association shall pay a registration fee of such amount as may be determined by the Board.

(*By-Laws*)

ARTICLE VII

SECTIONS AND DIVISIONS

SECTION 1. Local Sections may be established by the Board on receipt of a written request to that effect signed by twenty Active or Corporate Members of the Association residing in the territory

within which the Local Section is desired. The territory embraced by each Local Section shall be fixed by the Board.

SECTION 2. National Divisions consisting of superintendents, engineers, chemists, bacteriologists, and accountants or other classes of persons included in the membership of the Association may be established by the Board on the request of thirty members. Any member of the Association may resgister in any National Divison of the Association in which he is interested.

SECTION 3. Such Local Sections and National Divisions which shall consist only of members of this Association in good standing shall elect their own Officers and Committees, and may make any rules for their government not inconsistent with the Constitution and By-Laws of the Association, but these rules must first be approved by the Board.

SECTION 4. Each Local Section as soon as established, and after its rules have been approved by the Board, may with its approval annually receive from the Treasurer of the Association for local use not more than twenty-five per cent of the annual dues paid to the Association by the members of the said Local Section as shown by the books of the Association on the first day of November of each year, unless the Board increases the amount allowed to any Local Section, the amount of such increase to be determined by the Board, and to be allowed only when in the judgment of the Board the work undertaken by that Local Section is such as to be of material benefit to the Association. Unless the Board increases the amount allowed the total money received by any Local Section for any one fiscal year shall not exceed the sum of $300. Local Sections having small membership shall be entitled to receive from the Association $100 in any one fiscal year, even though the allotted twenty-five per cent of the annual dues paid to the Association by the members of the said Local Section does not amount to $100.

Each National Division when established and its rules and Constitution have been approved by the Board, may with the approval of the Board, annually receive from the Treasurer of the Association a sum not exceeding $100 for Division expenses.

The Treasurer of each Local Section or National Division shall forward to the Secretary of the Association his application endorsed by the Presiding Officer of the Section or Division for such portions of the said sums above specified as may be needed and upon receipt of such application the Secretary shall authorize the Treasurer of the

Association to pay such sums to the Treasurer of the Section or Division. These moneys may be used by the Section or Division only in payment of necessary operating expenses.

At the end of each fiscal year the Treasurer of each Section and Division shall submit a certified copy of his accounts to the Secretary of the Association, the same being itemized and showing the balance on hand of funds received from the Association which will remain to the credit of such Section or Division until such Section or Division is dissolved or the Board shall otherwise order their return to the treasury of the Association.

SECTION 5. Any member of the Association who resides in a locality which is not included in the territory embraced by an existing Local Section, may upon written request to the Board be included in the membership of any Local Section. The Secretary of the Association shall notify the Secretary of the Local Section of the enrollment of the member.

Whenever a new Local Section is formed or an existing Local Section has its territory extended which will include in its territory the locality where such member resides, he shall automatically be included in the membership of such Local Section.

SECTION 6. Any Section or Division may be dissolved by the Board for reasons which it believes are good and sufficient.

(By-Laws)

ARTICLE VIII

PUBLICATIONS

All publications of the Association shall be issued under the direction of the Board and shall be copyrighted as far as is practicable and proper.

(By-Laws)

ARTICLE IX

COMMITTEES

SECTION 1. A Publication Committee shall be appointed by the Board of the annual convention of the Association. It shall consist of at least five members, at large, and its Chairman shall be ex-officio a member of the Board.

It shall have control of the publications of the Association, including the programs of its conventions and shall see that all publications and papers are edited before publication.

The Committee shall prepare rules which shall govern the preparation, presentation, acceptance, and publication of all papers and such other matters of a similar nature as the best interests of the Association may require.

SECTION 2. A Committee on Water Works Practice shall be appointed by the Board at the annual convention. It shall consist of at least five members, at large, and its Chairman shall be ex-officio a member of the Board.

Any resolution, report or publication which undertakes to establish in the name of the Association, or any of its Sections or Divisions, professional or technical standards, shall be submitted to this Committee, and it shall direct all such matters on behalf of the Association.

It shall give notice by publication to the membership of all such proposed standards and report its approval or disapproval of such to the Board.

It shall appoint such Sub-Committees as it may deem necessary to properly carry on its work.

SECTION 3. The Board shall appoint such other Committees as may be necessary to carry on the work of the Association.

(*By-Laws*)

ARTICLE X

The Board of Directors may amend these By-Laws in any manner not inconsistent with the Constitution by a two-thirds vote of those voting at any meeting of the Board or by sealed letter ballot, providing that a copy of such proposed amendment has been mailed by the Secretary to each member of the Board at least thirty days prior to such meeting or letter ballot.

APPLICATION FOR MEMBERSHIP
IN THE
AMERICAN WATER WORKS ASSOCIATION
22 EAST 40th ST., NEW YORK

Date:.....

..... hereby make application for
(I or We)

.....
(Active, Junior, Corporate or Associate Membership, or Affiliate)

in the American Water Works Association, and enclose herewith the sum of $....., one year's dues in advance.

Name.....

Company or Department.....

Title or Position.....

Address.....

.....

If application is for Junior Membership, give date of birth.....

If application is for Affiliate, state number of active services in property where employed.....

Nature of business or character of work (for office records).....

.....

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If application is for Corporate or Associate Membership, it must be signed by the person designated to represent the firm or corporation in A.W.W.A. activities.

.....
Signature of Applicant.

Application obtained by:

.....

(over)

ARTICLE I OF BY-LAWS

Section 3. An Active Member shall be a superintendent, a manager, an official or employee of a municipal or private water works; a civil, mechanical, hydraulic, or sanitary engineer, a chemist, a bacteriologist, or any qualified person engaged or interested in the advancement of knowledge relating to water supplies. (Annual Dues, $10.00.)

Section 4. A Corporate Member shall be a Water Board, Water Commission, Water Department, Water Company or Corporation, National, State or District Board of Health, or other body, corporation or organization engaged or interested in water supply work, and shall be entitled to one representative whose name shall appear on the roll of members, and who shall have all the rights and privileges of an Active Member. This representative may be changed at the convenience and pleasure of the Corporate Member on written notice to the Secretary. (Annual Dues, $15.00.)

Section 5. An Associate Member shall be either a person, firm or corporation engaged in manufacturing or furnishing supplies for the operation, construction, or maintenance of water works. (Annual Dues, $25.00.)

Section 6. A Junior Member shall be an employee of a municipal or private water works; a civil, mechanical, hydraulic, or sanitary engineer, a chemist, a bacteriologist, a student or any otherwise qualified person engaged or interested in the advancement of knowledge relating to water supplies. At the time of his admission he shall be not less than eighteen years of age. His connection with the Association shall cease when he becomes twenty-five years of age, unless he is regularly enrolled as a student in a university or has previously transferred to the grade of Active Member. Junior Members shall receive the Journal and all privileges of Active membership except holding office and voting. (Annual Dues, $5.00.)

Section 7. An Affiliate shall be any person otherwise qualified for Active membership who, at the time of application, is not nor previously has been a member of the Association and who, for acceptable reasons, does not wish to become an Active Member.

No corporation, firm or partnership which otherwise would be entitled to the grades of Associate or Corporate member may hold the grade of Affiliate. No employee of an Associate member may become an Affiliate. No person who is the superintendent, the manager, the chief engineer, the superintendent of filtration, the chief chemist, or the superintendent of distribution in a plant having more than 3,000 active services, is eligible for the grade of Affiliate. Under unusual conditions, exception to the above may be made by action of the Executive Committee if the applicant sets forth fully the reasons for the exception when applying for the Affiliate grade.

Affiliates shall not be entitled to vote upon general Association questions, and not eligible to hold office in the Association, nor in any of its Divisions. They shall be eligible to vote upon Section questions and to hold Section offices except those of Chairman, Vice-Chairman, Secretary (and/or Treasurer). They shall be entitled to all other rights and privileges of Active Members. Affiliates receive the March, June, September and December issues of the Journal each year. (Annual Dues, $4.00.)

Memberships will be dated as of the beginning of the quarter in which the application is received.

Membership in the Association carries, also with no additional dues, membership in its Local Sections and National Divisions, and includes the Journal, a monthly publication devoted to water works interest. The proceedings of the annual conventions and of the meetings of the Local Sections are published in the Journal, which also contains contributed articles on subjects pertaining to public water supplies.

To the Members of the American Water Works Association:

The committee reports printed in this issue of the JOURNAL of the American Water Works Association are tentative specifications and are published to solicit constructive criticism from the membership as a whole. It is respectfully requested that all such criticisms and communications be addressed to Mr. William W. Hurlbut, Chairman of Subcommittee 7A Steel Plate Pipe, P. O. Box 240, Los Angeles, California.

Three reports (Tentative Specification for Coal-Tar Enamel Protective Coatings for Steel Water Pipe of Sizes 30 Inches and Over, 7A.5; Tentative Specification for Coal-Tar Enamel Protective Coatings for Steel Water Pipe of Sizes 4½ Inches O.D. up to but not Including 30 Inches, 7A.6; and Tentative Specification for Cement-Mortar Protective Coating for Steel Water Pipe of Sizes 30 Inches and Over, 7A.7) have been prepared to provide protection for steel water pipe for both underground and surface requirements. However, it is recognized by this Committee that in some waters and in some soils protection to the inside and outside pipe surfaces is not necessary and this Committee does not attempt to make mandatory the use of such protection or to evaluate the condition of its use.

The Committee has under consideration other materials for the protection of steel water pipe and when such materials have been developed to afford protection, specifications covering their use will be prepared.

Yours very truly,
(Signed) WILLIAM W. HURLBUT
Chairman, Subcommittee 7A
Steel Plate Pipe

Tentative Standard

American Water Works Association

SPECIFICATION

for

RIVETED STEEL PIPE

Prepared by

Water Works Practice Subcommittee 7A

Personnel

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**Chairman*

These tentative specifications are part of a series of reports by A. W. W. A. Subcommittee 7A. They are as yet in tentative form and are printed for the purpose of bringing them to the attention of the membership of the Association.

Comments should be addressed to WILLIAM W. HURLBUT, Chairman of Subcommittee 7A Steel Plate Pipe, P. O. Box 240, Los Angeles California.

These are not official specifications of the A. W. W. A.; must not be referred to as such; and no authority is given or implied which would permit their use as official documents.—HARRY E. JORDAN, *Secretary, A. W. W. A.*

ACKNOWLEDGMENT

Acknowledgment is made and appreciation expressed to Arthur R. Holbrook and F. H. Stephenson for their assistance and co-operation in the preparation of this specification.

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Tentative Standard

SPECIFIGATION FOR RIVETED STEEL PIPE

GENERAL—SECT. 1-1

Sect. 1-1.1—Scope

This specification covers the manufacture of pipe, intended for the conveyance of water, which is made from steel plates with riveted seams. The pipe shall be shop fabricated into sections having laying lengths of approximately thirty (30) feet except where shorter lengths are required for closures, curves, changes in alignment or grade, or to meet special conditions. Each section shall be made up of not more than four courses. In general, longitudinal seams shall be double riveted lap and circular seams single riveted lap. Field joints shall be single riveted lap unless otherwise specified.

MATERIALS—SECT. 1-2

Sect. 1-2.1—A.S.T.M. Serial Designations

(a) Steel for plates and rivets, except as hereinafter modified, shall meet all requirements of the American Society for Testing Materials for the serial designation and grade as set forth below, including the chemical and physical properties, permissible variations in weight and thickness, and inspection and rejection, and all specimens and records shall be furnished and analyses and tests made as therein provided. The steel shall also meet the requirements of the additional tests hereinafter specified.

	Serial Designation and Grade	Title
For Plates	A.S.T.M. A-30 "Flange" Quality as last revised	Boiler and Fire Box Steel for Locomotives
For Rivets	A.S.T.M. A-31 as last revised	Boiler Rivet Steel and Rivets

(b) Plates shall be ordered to thickness.

Sect. 1-2.2—Mill Inspection of Plates

(a) The contractor shall notify the engineer or authorized inspector, in writing, at least five (5) days in advance of rolling, sampling, and testing of the plate in order that the purchaser may arrange for mill inspection if so desired. The contractor shall furnish the purchaser certified copies of the mill test reports showing the results of all physical and chemical tests on each heat from which the material is furnished.

(b) The engineer may also require the contractor to furnish him with specimen plates of the steel to be used in the manufacture of the pipe. Specimen plates shall be of the size necessary to obtain the number of specimens required in the particular specification under which the material is to be furnished and the tests of the specimens will be furnished by the purchaser. If the specimens fail to meet the requirements of the specification under which they were manufactured, a second test shall be made, and if all the specimens meet the requirements the plates will be accepted but if any of them fail to meet the requirements, all materials furnished under the same heat number shall be rejected. The contractor will be charged by the purchaser for all expenses incurred in making a second test.

(c) All plates showing slag particles, roughness, or imperfections of any description shall be rejected. Laminations disclosed on a careful inspection of the sheared edges shall be sufficient cause for rejection.

Sect. 1-2.3—Drift Tests

Drift tests shall be made by punching not less than two (2) holes, $\frac{3}{4}$ inch diameter, spaced two (2) inches on centers and $1\frac{1}{2}$ inches from the edge, and then enlarged cold by heavy blows of a sledge hammer upon a drifting pin until the holes are at least $1\frac{1}{4}$ inches in diameter, without causing any cracks. One drift test shall be made from each heat of steel.

Sect. 1-2.4—Inspection at Shop

At the fabricating shop plates shall be inspected and any plates proving to be less than the specified thickness or minimum size, or that show defects or that develop defects during the manufacturing process shall be rejected.

Sect. 1-2.5—Material Free from Rust

All plates and rivets shall be free from rust and shall be properly protected and kept free from rust from the time of their manufacture

until they are fabricated into pipe. Plates showing rust that cannot be corrected shall be rejected.

FABRICATION—SECT. 1-3

Sect. 1-3.1—Workmanship

All shearing, lap breaking, scarfing, punching, reaming, fitting, riveting, calking, and other shop operations shall be done in accordance with the best boiler shop practice.

Sect. 1-3.2—Shape and Length of Courses and Number of Plates per Course

Pipes shall, in general, be made with taper courses and fabricated and laid out so that the smaller diameter of each section shall be at the down-stream end. Pipe made with alternate inside and outside courses will be accepted, provided there be no reduction in the thickness or nominal diameter. The nominal diameter called for shall be the minimum inside diameter measured to the plate for pipes made with taper courses and the diameter measured to the inside of the inner course for pipes made with alternate inside and outside courses. The length of the courses shall be not less than 7 feet 6 inches center to center of circular joints on regular straight pipes and on the long side of curves cut or beveled to form angles or curves except those of short radius. In general each course shall be formed of one plate.

Sect. 1-3.3—Length of Sections

Straight pipe sections made in the shop shall have a laying length of not less than 30 feet except where shorter lengths may be required for closures.

Sect. 1-3.4—Shopwork on Plates

The plates shall be laid out and sheared to the oblique cambered or curved edges required for conical shapes or straight edges for cylinders and punched or drilled to corresponding lines and shall be cold rolled to true truncated cones or cylinders. Before the plates are rolled, all longitudinal edges of plates shall be formed in a crimping press having dies that are machined to the proper radius of the pipe shell, and the pressure exerted in the crimping operation shall be sufficient to secure a true and uniform curve at the edges of the plates. There shall be no heating or hammering for shaping or curving nor for any other purpose except for scarfing and the necessary forming of sharp bends. All parts shall be adjusted to a perfect fit and properly marked.

Sect. 1-3.5—Alternation of Longitudinal Seams

In the shop and field assembly longitudinal seams shall be alternated approximately 45° but not more than 18 inches arc distance each side of the top center line of the pipe. Longitudinal seams shall be in line with their outside calking edges facing upward.

Sect. 1-3.6—Shearing and Calking

The calking edges of all plates, except where butt calked, shall be bevel sheared to an angle of 70° with the plane of the plate by approved means that will cut them accurately to the required lines and give a satisfactory calking edge. All joints shall be calked both inside and outside. At the junction of the circular and longitudinal seams the plates shall be scarfed to a fine edge by heating the plates and hammering to the desired shape. The extent of the scarfing shall be such as to include at least two (2) rivets of the circumferential seam. Where butt-strap joints are required the material for the butt-straps shall be cut across the width of full-sized plates.

Sect. 1-3.7—Rivet Holes

The work shall be carefully and accurately laid out and all rivet holes shall be spaced with precision. Holes shall be drilled from the solid or punched to an approved sub-size and reamed. Punched holes shall be clean cut, without torn or ragged edges and in punching only the best and sharpest dies shall be used. The punch shall be applied to the side of the plate which is to be placed in contact with another plate. All burrs or splits caused by punching shall be removed by suitable means. All field holes not ordered drilled in the field shall be sub-punched or drilled to the diameters ordered and reamed after assembly. Corresponding holes shall, without enlarging, coincide within about $\frac{1}{32}$ inch, and all plates in which corresponding holes do not so coincide shall be rejected unless the Engineer shall be of the opinion that the conditions of stress are such at the point in question that the required enlargement will not be unsafe, in which case an appropriate over-size rivet shall be used. Drift pins shall not be used for forcing holes. In general the diameter of the rivet hole shall exceed the diameter of the rivet by $\frac{1}{16}$ inch. Where partially or fully countersunk rivet heads are specified for the inside of the pipe the rivet holes shall be countersunk as shown on the contract drawings or as required.

Sect. 1-3.8—Shop Riveting

In shop riveting each rivet shall be driven at such heat and at such pressure by hydraulic, compressed-air or steam machinery so as to produce the best results. This pressure shall be retained until the rivet head has been perfectly formed and the metal has lost its red color. Before any rivets are driven the plates shall be brought into close contact by suitably applied pressure which shall be maintained until the rivets are driven. Equally acceptable results shall be obtained in the field by the use of pneumatic or hydraulic tools and by thorough bolting up. Any rivet that is in any way defective shall be cut out and replaced by one that is acceptable. All rivets shall be perfect in form; when driven they shall completely fill the holes and have heads of proper form and size, free from checks and cracks and truly concentric with the shank. All exterior rivet heads shall be button head or other approved type and on the inside of the pipe they shall be button head, shallow head or countersunk as required or shown. Rivets of extra length shall be used when riveting through more than two thicknesses of plate and in all places where castings or flanges of any description are to be attached to the pipes.

Sect. 1-3.9—Samples of Riveting

In order to prove the sufficiency of proposed rivet-driving pressures and of methods and apparatus for both shop and field joints the contractor shall supply, as directed, samples of each kind of joint and riveting, made under identical conditions as he proposes to use for the pipe. These samples shall be from $7\frac{1}{2}$ inches to $10\frac{1}{2}$ inches wide and 12 inches to 30 inches long after fabrication. If the results of any test of these samples indicate unsatisfactory methods, the methods shall be modified and new samples furnished for test until satisfactory methods are secured. The contractor shall do such sawing through plates and rivets as may be required to show the degree of closeness with which the rivets fill the holes.

Sect. 1-3.10—Connections

Manhole, blowoff and air valve, hydrant, lateral and other connection castings required or shown shall be riveted and calked to the pipes as shown on the drawings or as ordered. Unless otherwise ordered or permitted the riveting of connection castings and the cutting of outlets in the steel pipes for connections shall be done in the field after the pipes are placed in the trench. All cutting, drilling, reaming,

calking, and other work necessitated by connections shall be included in the prices stipulated for the appropriate items. The contractor may be permitted to construct additional manholes of the specified or approved design in the pipe lines for construction purposes but only at approved places and no work or material in connection with such additional manholes will be estimated for payment. Where shown or required cast steel hub or spigot connection rings, as directed, shall be riveted to the pipe in an approved manner.

Sect. 1-3.11—Drop Holes

Suitable openings of small diameter will be permitted in the pipes for introducing hot rivets for field riveting, for testing or other purposes but, in general, not over one to each alternate section of pipe. These openings shall be provided with cast steel or forged steel saddles riveted on and calked. Openings in the saddles shall be properly tapped and closed by screw plugs after the sections are riveted in the field and before the trench is backfilled. All plugs shall be solid of cast steel or of acceptable cast iron of approved design. Saddles may be omitted in plates $\frac{3}{8}$ inch and over in thickness and the pipe tapped for screw plugs if specified by the purchaser. The cost of furnishing and placing the steel saddles and plugs shall be included in the prices stipulated for the steel pipes.

Sect. 1-3.12—Curves

Wherever changes in line or grade of the pipes make angles necessary they shall be formed by cutting and beveling the ends of a sufficient number of courses to produce the desired total deflection or curvature. The deflection angle formed by two consecutive courses shall not exceed $7\frac{1}{2}$ degrees on any shop joint or 5 degrees on any field joint.

Sect. 1-3.13—Shop Test

After being calked and before being coated, each section of pipe, except short radius bends and other specials, which in the judgment of the engineer cannot be so tested, shall be tested and made tight under such hydrostatic pressure as will develop in the plates a stress of 10,000 pounds per square inch. Pipes shall be made tight to this pressure.

Sect. 1-3.14—Stopping Leaks

All leaks shall be stopped by upsetting the metal with the proper calking tools. Rivet calking shall not be done if the rivet is loose, unless the leak is slight and easily closed; otherwise the rivet shall be

cut out and replaced by one that is acceptable. If leaks are numerous and of a nature which will not permit of satisfactory repair, the whole section shall be rejected.

Sect. 1-3.15—Marking

Each section of pipe and each special shall have conspicuously painted in white on the inside at each end after coating a serial number for identification. Where the pipes are coated in a storage yard such marking shall be done in the shop and later transferred to the inside coating. The contractor shall furnish the engineer with field sketches showing where each numbered pipe or special goes in the line and the numbers on such sketches shall correspond with those painted on the pipe and specials.

Sect. 1-3.16—Inspection and Rejection

The inspector representing the purchaser shall have free entry at all times, while work on the contract of the purchaser is being performed, to all parts of the manufacturer's works which concern the manufacture of the pipe ordered. The manufacturer shall afford the inspector, without charge, all reasonable facilities to satisfy him that the pipe is being furnished in accordance with this specification. All tests and inspection shall be made at the place of manufacture prior to shipment unless otherwise specified and shall be so conducted as not to interfere unnecessarily with the operation of the works.

Sect. 1-3.17—Coating Pipe

Before the pipe is coated it shall be thoroughly cleaned. Dirt, rust, loose mill scale, and foreign substances shall be removed by power driven wire brushes, scrapers, sand or shot blasting or other approved methods. All oil and grease shall be removed with a solvent which is not detrimental to the coating material to be used. If specifically required under the contract, firm mill scale shall also be removed and the pipe shall be cleaned entirely of all scale by sand or shot blasting.

Tentative Standard

American Water Works Association

SPECIFICATION

for

LOCK-BAR PIPE

Prepared by

Water Works Practice Subcommittee 7A

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These tentative specifications are part of a series of reports by A. W. W. A. Subcommittee 7A. They are as yet in tentative form and are printed for the purpose of bringing them to the attention of the membership of the Association.

Comments should be addressed to WILLIAM W. HURLBUT, Chairman of Subcommittee 7A Steel Plate Pipe, P. O. Box 240, Los Angeles California.

These are not official specifications of the A. W. W. A.; must not be referred to as such; and no authority is given or implied which would permit their use as official documents.—HARRY E. JORDAN, *Secretary, A. W. W. A.*

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Acknowledgment is made and appreciation expressed to Arthur R. Holbrook and F. H. Stephenson for their assistance and cooperation in the preparation of this specification.

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Tentative Standard

SPECIFICATION FOR LOCK-BAR PIPE

GENERAL—SECT. 2-1

Sect. 2-1.1—Scope

This specification covers the manufacture of lock-bar pipe intended for the conveyance of water which is made from steel plates rolled or formed to a circular cross section, having longitudinal edges planed and upset to a dovetail form which engages in the groove of an "H-shape" steel lock-bar to form the longitudinal joint of the pipe. After assembly of the plates and the lock-bars the latter are closed by cold pressing thus making a tight fit over the dovetail edges of the plates. Pipes are shop fabricated into sections having laying lengths of approximately 30 feet except where shorter lengths are required for closure, curves, changes in alignment or grade to meet special conditions. Circumferential field joints are single riveted unless otherwise specified.*

MATERIALS—SECT. 2-2

Sect. 2-2.1—Quality of Materials and A.S.T.M. Serial Designations

(a) Steel for plates, rivets, and lock-bars shall be made by the basic open hearth process and except as hereinafter modified, shall meet all the requirements of the standard specifications of the American Society for Testing Materials applicable to the serial designation and grade specified below, including the chemical and physical properties, permissible variations in weight and thickness, inspection and rejection, and all specimens and records shall be furnished and analyses and tests made as therein provided. The steel shall

* See Addendum for lock-bar pipe with ends prepared for mechanical couplings.

also meet the requirements of the additional tests hereinafter specified.

	Serial Designation and Grade	Title
For Plates	A.S.T.M. A-30 "Flange" Quality as last revised	Boiler and Fire Box Steel for Locomotives
For Rivets	A.S.T.M. A-31 as last revised	Boiler Rivet Steel and Rivets

(b) Steel for lock-bars shall be extra dead soft steel conforming to the following chemical and physical requirements:

Chemical Composition:

Phosphorus, maximum per cent	0.04
Sulfur, maximum per cent	0.05

Physical Properties:

Tensile strength lb. per sq.in.	40,000 to 50,000
Yield point, minimum lb. per sq.in.	0.5 × T.S.
Elongation in 8 in. minimum per cent	28
Reduction in area, minimum per cent	50

Cold bend test −180° flat on itself without sign of fracture on outside of bent portion.

(c) Analyses and tests to determine the chemical and physical properties of the steel for lock-bars shall be made as required under A.S.T.M. A-30 and specimens and records furnished.

(d) Plates shall be ordered to thickness.

Sect. 2-2.2—Mill Inspection of Plates

(a) The contractor shall notify the engineer or authorized inspector, in writing, at least five days in advance of rolling, sampling, and testing of the plate and lock-bars in order that the purchaser may arrange for mill inspection if so desired. The contractor shall furnish the purchaser certified copies of the mill test reports showing the results of all physical and chemical tests on each heat from which the material is furnished.

(b) The engineer may also require the contractor to furnish him with specimen plates of the steel to be used in the manufacture of the pipe. Specimen plates shall be of the size necessary to obtain the number of specimens required in the particular specification under which the material is to be furnished and the tests of the specimens will be furnished by the purchaser. If the specimens fail to meet the requirements of the specification under which they were manufactured, a second test shall be made, and if the second set of specimens meet the requirements the plate will be accepted, but if any of them fail to meet the requirements all materials furnished under the

same heat number will be rejected. The contractor will be charged by the purchaser for all expenses incurred in making a second test.

(c) If structural defects, pits, or laminations are found in any material which, in the opinion of the inspector, will be unsatisfactory, the material will be rejected. Laminations disclosed on a careful inspection of the sheared edges shall be sufficient cause for rejection.

Sect. 2-2.3—Drift Tests

Drift tests shall be made by punching not less than 2 holes, $\frac{3}{4}$ of an inch in diameter, spaced 2 inches on centers and $1\frac{1}{2}$ inches from the edge and then enlarged cold by heavy blows of a sledge hammer upon a drifting pin until the holes are at least $1\frac{1}{4}$ inches in diameter without causing any cracks. One drift test shall be made from each heat of steel.

Sect. 2-2.4—Inspection at Shop

(a) At the fabricating shop material shall be inspected and any material exceeding the allowable tolerances less than the specified thickness or minimum size, or that show defects or that develop defects during the manufacturing process shall be rejected.

(b) Lock-bars in which surface checks develop under hydrostatic pressure and at any time thereafter or which are defective from any cause shall be rejected. The lock-bars shall be rolled true and the billets from which they are rolled shall be free from seams and cracks.

Sect. 2-2.5—Material Free from Rust

All plates and rivets shall be free from rust and shall be properly protected and kept free from rust from the time of their manufacture until they are fabricated into pipe. Plates showing rust that cannot be corrected shall be rejected.

FABRICATION—SECT. 2-3

Sect. 2-3.1—Workmanship

All shearing, planing, crimping, scarfing, punching, reaming, fitting, riveting, calking, and other shop operations shall be done in accordance with best shop practice.

Sect. 2-3.2—Length and Shape of Sections and Number of Plates per Section

Lock-bar steel pipe shall be made in the shop in sections approximately 30 feet long between centers of end rivet holes, except

where shorter lengths may be required for closures. Sections may be tapered or may consist of alternate in and out sections. The nominal diameter called for shall be the minimum inside diameter measured to the plate for pipes made with tapered courses and the diameter measured to the inside of the inner course for pipe made with alternate inside and outside courses. In general each section shall be formed of two plates of length equal to the length of the section. Specials may be riveted if desired.

Sect. 2-3.3—Shopwork on Plates

(a) Plates shall be of such dimensions as will admit of being rolled to truncated cones or cylinders of the required dimensions with not more than two longitudinal joints and forming conduits which at the smallest places shall have the specified internal diameters, measuring to the surface of the plates. The plates shall be laid out and sheared accurately to dimension, working to oblique cambered or curved edges as required for conical shapes and punched or drilled to corresponding lines. The ends of the plates shall be planed or bevel sheared to an angle of seventy degrees with the plane of the plate to form calking edges for the circular field joints. There shall be no heating or hammering for shaping or curving nor for any other purpose except for scarfing and the necessary forming of sharp bends. All parts shall be adjusted to a perfect fit and properly marked.

(b) The longitudinal edges of the plate shall be planed and upset to a sufficient degree to form the necessary shoulders for engaging the lock-bar, and along the longitudinal edges which because of the upsetting would be damaged in the rolls the plates shall be crimped cold to the required curvature for the pipe. The remainder of the plate shall be cold rolled to the required shape.

Sect. 2-3.4—Rivet Holes

Rivet holes in the ends of the sections should be drilled if the contractor's equipment permits; if not, plates should be punched to an approved sub-size and reamed to the finished diameter. Plates thicker than $\frac{7}{8}$ of an inch shall be drilled. In punching only the best and sharpest dies shall be used. The punch shall be applied to the side of the plate which is to be placed in contact with another plate. All burrs and splits caused by punching shall be removed by suitable means. All field holes not ordered drilled in the field shall be subpunched or drilled to the diameters ordered and reamed after assembly. Corresponding holes shall without enlarging coincide within

about $\frac{1}{32}$ of an inch, and all sections in which corresponding holes do not so coincide shall be rejected unless the engineer shall be of the opinion that the conditions of stress are such at the point in question that the required enlargement will not be unsafe in which case an appropriate oversize rivet shall be used. Drift pins shall not be used for forcing holes. In general the diameter of the rivet hole shall exceed the diameter of the rivet by $\frac{1}{16}$ of an inch. Where partially or fully countersunk rivet heads are specified for the inside of the pipe joint the rivet holes shall be countersunk as shown on the contract drawings or as specified.

Sect. 2-3.5—Shop Riveting

In shop riveting each rivet shall be driven at such heat and at such pressure by hydraulic, compressed air or steam machinery so as to produce the best results. This pressure shall be maintained until the rivet head has been perfectly formed and the metal has lost its red color. Before any rivets are driven the plates shall be brought into close contact by suitably applied pressure which shall be maintained until the rivets are driven. Equally acceptable results shall be obtained in the field by the use of pneumatic or hydraulic tools or by thorough bolting up. Any rivet that is in any way defective shall be cut out and replaced by one that is acceptable. All rivets shall be perfect in form; when driven they shall completely fill the holes and have heads of proper form and size, free from checks and cracks and truly concentric with the shank. All exterior rivet heads shall be button head or other approved type and on the inside of the pipe they shall be button head, shallow head, or countersunk as required or shown. Rivets of extra length shall be used when riveting through more than two thicknesses of plate and in all places where castings or flanges of any descriptions are to be attached to the pipes.

Sect. 2-3.6—Shop Work on Lock-Bars and Assembling the Sections

(a) The lock-bar, having previously been scarf-milled at opposite ends on the laying side of the pipe to about $\frac{1}{8}$ of an inch in thickness, shall be applied to one edge of the plate. The other plate edge forming the joint shall be entered into the lock-bar and the two edges drawn together by steel clamps until the plates set firmly and are held in the bottom of the slots in the lock-bar. The pipe shall then be placed in a pressing machine and lock-bars pressed down over the opposite edges of the plate by hydraulic pressure, such pressure to be applied for a sufficient time to allow for permanent set of the metal

in the bar. After the bars have been pressed the ends shall be trimmed to conform to the bevel of the edges of the plate.

(b) The full section of the upsetting of the plates and full compression of the lock-bars shall be obtained at every point of the length of every pipe to make the longitudinal joints of the pipe watertight and of a strength at least equal to 90 per cent of that of the plate.

(c) The radius of curvature within one foot of the end of the individual lengths shall not vary more than $\frac{1}{16}$ of an inch from the specified radius; at any other part of the section this variation in radius may be $\frac{1}{8}$ of an inch.

Sect. 2-3.7—Test to Determine Efficiency of the Longitudinal Joint

To test the efficiency of the longitudinal joint and of the pressing machine used for joining the edges of the plates with the lock-bar a sample at least 6 inches wide by 18 inches long shall be cut transversely across the longitudinal joint of one of the first pipes fabricated and this joint when tested in tension shall develop not less than 90 per cent of the ultimate strength of the plate. If the first specimen fails to develop the required strength, the pipes from the group samples shall be rejected and the methods and apparatus shall be changed and additional test specimens taken until a set of three consecutive specimens is obtained, all three of which give the required strength of joint.

Sect. 2-3.8—Connections

Manhole, blowoff, hydrant, lateral and other connection castings required or shown shall be riveted and calked to the pipes as shown on the drawings or as ordered. Unless otherwise specified, the riveting of connection castings and cutting of outlets in the steel pipe for connections shall be done in the field after the pipes are placed in the trench. All cutting, drilling, reaming, calking, and other work necessitated by connections shall be included in the prices stipulated for the appropriate items. Where shown or required cast steel hub or spigot connection rings as directed shall be riveted to the pipe in an approved manner.

Sect. 2-3.9—Drop Holes

Suitable openings of small diameter will be permitted in the pipes for introducing hot rivets for field riveting, for testing or other purposes but in general not over one to a section of pipe. These openings shall be provided with cast steel or forged steel saddles riveted on and calked. Openings in the saddles shall be properly tapped

and closed by screw plugs after the sections are riveted in the field and before the trench is backfilled. All plugs shall be solid and of cast steel or cast iron of approved design. The cost of furnishing and placing the steel saddles and plugs shall be included in the prices stipulated for the steel pipes.

Sect. 2-3.10—Curves

Whenever changes in line or grade of the pipes make angles necessary they shall be formed by cutting and beveling the ends of a sufficient number of courses to produce the desired total deflections or curvature. The deflection angle formed by two consecutive courses shall not exceed $7\frac{1}{2}$ degrees on any shop joint or 5 degrees on any field joint.

Sect. 2-3.11—Shop Test

After being calked and before being coated, each section of pipe, except short radius bends and other specials, which in the judgment of the engineer cannot be so tested, shall be tested and made tight under such hydrostatic pressure as will develop in the plates a stress of* — pounds per square inch. Pipes shall be made tight at this pressure.

Sect. 2-3.12—Stopping Leaks

All leaks shall be stopped by upsetting the metal with the proper calking tools. If leaks are numerous and of a nature which will not permit of satisfactory repair, the whole section shall be rejected.

Sect. 2-3.13—Marking

Each section of pipe and each special shall have conspicuously painted in white, on the inside at each end after coating a serial number for identification. Where the pipes are coated in a storage yard such marking shall be done in the shop and later transferred to the inside coating. The contractor shall furnish the engineer with field sketches showing where each numbered pipe or special goes in the line and the numbers on such sketches shall correspond with those painted on the pipes and specials.

Sect. 2-3.14—Inspection and Rejection

The inspector representing the purchaser shall have free entry, at all times while work on the contract of the purchaser is being performed, to all parts of the manufacturer's works which concern the

* Purchaser to specify stress in pounds per square inch.

manufacture of the pipe ordered. The manufacturer shall afford the inspector, without charge, all reasonable facilities to satisfy him that the pipe is being furnished in accordance with this specification. All tests and inspection shall be made at the place of manufacture prior to shipment unless otherwise specified and shall be conducted so as not to interfere unnecessarily with the operation of the works.

Sect. 2-3.15—Coating Pipe

Before the pipe is coated it shall be thoroughly cleaned. Dirt, rust, loose mill scale, and foreign substances shall be removed by power driven wire brushes, scrapers, sand or shot blasting, or other approved methods. All oil and grease shall be removed with a solvent which is not detrimental to the coating material to be used. If specifically required under the contract, firm mill scale shall also be removed and the pipe shall be cleaned entirely of all scale by sand or shot blasting.

Sect. A2-1—Addendum

Where lock-bar pipe is required to be furnished with the same inside diameter throughout, ends shall be prepared for mechanical couplings by removing the lock-bar section a distance 10 inches back from the end and welding the seam, or pipe may be used with special mechanical couplings bridging the lock-bar.

Tentative Standard

American Water Works Association

SPECIFICATION

for

ELECTRIC FUSION WELDED STEEL WATER PIPE

FOR SIZES 30 INCHES AND OVER

Prepared by

Water Works Practice Subcommittee 7A

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**Chairman*

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Tentative Standard

SPECIFICATION FOR ELECTRIC FUSION WELDED STEEL WATER PIPE

FOR SIZES 30 INCHES AND OVER

GENERAL—SECT. 3-1

Sect. 3-1.1—Scope

This specification covers the manufacture of straight seam or spiral seam electric fusion welded steel pipe, intended for the conveyance of water, which is thirty (30) inches and greater in diameter and is in twenty (20) feet and longer laying length straight sections or other special sections which are required for closures, curves, changes in alignment or grade to meet special conditions. The contractor, as bidder, shall submit to the purchaser the details of the procedure he proposes to use in the fabrication of the pipe and special sections. This procedure shall comply with the specifications given hereinafter unless otherwise agreed to by the engineer during the progress of the work.

Sect. 3-1.2—Supplementary Details to be Specified by Purchaser

When purchasing pipe under this specification it will be necessary for the purchaser to make supplementary specific statement in his specification regarding the following:

(a) Nominal inside diameter of pipe.

(b) Thickness of steel plate material.

(c) Laying length of pipe sections.

(d) Working water pressure for each plate thickness of pipe.

(e) The number of longitudinal and girth seams for each pipe section.

(f) Detailed description of the type of pipe ends with all drawings necessary to show shape, width, thickness, beveling, or other details. Types of pipe ends are indicated in Section 3-2.4 of this specification.

(g) Standard specification number and the grade of steel plate material required.

(h) Detailed description and drawings of all special sections indicating for each component part the dimensions, the standard specification number and the grade of material required, the type of ends, and the required hydrostatic test pressure.

(i) Detailed description and drawings of all adaptors indicating for each component part the dimensions, the standard specification number and the grade of material required.

(j) Shop drawings to be furnished by the contractor for all pipe and special sections under this specification.

(k) Stress relieving of special pipe sections if specified (see Appendix).

Sect. 3-1.3—Definitions

Under this specification the following definitions will apply:

(a) *Purchaser:* The word "Purchaser" shall mean either person, firm, corporation, or governmental subdivision entering into a contract or agreement for the purchase of any materials and/or any work to be performed under this specification.

(b) *Contractor:* The word "Contractor" shall mean the person, firm, or corporation executing the contract or agreement with the purchaser to furnish any material and/or perform any work under this specification.

(c) *Inspector:* The word "Inspector" shall mean the inspector or engineer of the purchaser or their respective assistants properly authorized and limited by the particular duties entrusted to them.

(d) *Fusion Welding:* The words "Fusion Welding" shall mean the process of welding metals in the molten, or molten and vaporous state, without the application of mechanical pressure or blows.

(e) *Strength Weld:* The words "Strength Weld" shall mean a weld designed to have a predetermined strength and primarily intended to secure a mechanically strong joint. The weld may be continuous or intermittent.

(f) *Seal Weld:* The words "Seal Weld" shall mean a continuous weld primarily intended to secure tightness.

(g) *Root:* The word "Root" shall mean the zone at the bottom of the cross-sectional space provided to contain a fusion weld.

(h) *Throat:* The word "Throat" shall mean the thickness of weld, not including reinforcing, along a straight line passing through the root.

(i) *Fillet Weld:* The words "Fillet Weld" shall mean a weld of approximately triangular cross-section whose throat lies in a plane disposed approximately 45 degrees with respect to the surfaces of the parts joined. The size of a fillet weld shall be expressed in terms of the width in inches of one of its adjacent fused legs, the shorter if unequal.

(j) *Butt Weld:* The words "Butt Weld" shall mean a weld whose throat lies in a plane disposed approximately 90 degrees with respect to the surfaces of at least one of the parts joined. The size of a butt weld shall be expressed in terms of its net or unreinforced throat dimensions in inches. A double welded butt joint is one in which the filler metal is added to both sides. A single welded butt joint is one in which the filler metal is added to one side only.

(k) *Flame Cutting:* The words "Flame Cutting" shall mean the process of severing metal by means of a gas flame.

Sect. 3-1.4—Inspection

(a) All work and material under this specification will be rigidly inspected during all phases of manufacture and testing and such inspection shall not relieve the contractor of his responsibility to furnish material and perform work in accordance with this specification.

(b) The contractor shall notify the purchaser in advance of the production of materials and fabrication thereof in order that the purchaser may arrange for mill and shop inspection.

(c) The inspector may reject any or all pipe sections or special sections that are not of the material specified, are not fabricated in accordance with the outlined procedure, and that do not obtain the prescribed test results, condition of pipe, and tolerances set forth in this specification, drawings, and the purchaser's supplementary specification.

Sect. 3-1.5—Access for Inspector

The inspector shall have free access to those parts of all plants that are concerned with the furnishing of materials or the performance of work under this specification.

Sect. 3-1.6—Facilities for Inspector

The contractor shall furnish the Inspector reasonable facilities and space without charge for the inspection, testing, and obtaining of any information he desires respecting the character of material used and the progress and manner of the work.

Sect. 3-1.7—Inspectors

Inspectors shall be qualified by training and experience in fabrication of steel pipe of the character intended by this specification.

Sect. 3-1.8—Material and Workmanship

(a) All material furnished by the contractor shall be of the specified quality. All work shall be done in a thorough workmanlike manner by mechanics skilled in their various trades notwithstanding any omissions in the drawings and specification.

(b) Any plate or fabricated pipe that reveals scars or injuries from hammering or other causes may be rejected. Any plate that develops irreparable defects during fabrication of pipe will be rejected. If structural defects, pits, or laminations are found in any material which, in the opinion of the inspector, cannot be corrected satisfactorily by welding, the material will be rejected.

Sect. 3-1.9—Equipment—General Provisions

The contractor's equipment for all fabrication, welding, and flame cutting shall be designed and manufactured and shall be in such condition to permit fabricators and qualified welding operators to follow the procedure agreed upon and obtain the results prescribed in this specification.

Sect. 3-1.10—Arc Welding Equipment

(a) *Generators:* Generators and transformers shall be designed expressly for welding, shall be capable of delivering substantially constant current and shall be adjustable through a range ample for the requirements of the work. They shall be provided with controlling devices and suitable meters showing at all times the welding current, arc voltage, and speed of welding.

(b) *Automatic Welding Heads:* Automatic welding heads with suitable auxiliary handling equipment to provide control of electrode speed and welding arc shall be subject to the requirements of this specification.

(c) *Welding Cable and Holders:* Welding cable shall have sufficient conductivity to avoid inadequate voltage and current at the arc and shall be insulated sufficiently to avoid short circuits. Electrode holders shall provide clean surfaces in contact with electrodes and shall hold electrodes firmly as required by the welding process.

Sect. 3-1.11—Drawings

Drawings referred to in this specification shall be the Purchaser's drawings or the contractor's drawings approved by the Purchaser.

Sect. 3-1.12—Testing

Pipe sections and special sections shall be tested as required herein. Steel plate material shall be subjected to the required mill test at the steel manufacturer's plant and, at the inspector's option, a test of a specimen plate of the steel plate material will be made as stated in Sect. 3-2.1 of this specification. Welding operators shall be qualified and tested as stated in Sect. 3-3.6 of this specification. Test of welded joints shall be made as stated in Sects. 3-5.1, 3-5.2 and 3-5.3 of this specification. The hydrostatic test of finished sections shall be made as stated in Sect. 3-5.4 of this specification.

DESCRIPTION OF PIPE—SECT. 3-2

Sect. 3-2.1—Grade of Steel Plate

(a) Grade of steel plate which will be specified by the purchaser shall conform to the American Society for Testing Materials Standard Specification, Designation: A 78, Grade B, as last revised, entitled "Steel Plate of Structural Quality for Forge Welding," or as otherwise specified by the purchaser.

(b) Steel plate shall be ordered to thickness with a maximum allowable variation of not more than $\frac{1}{100}$ of an inch under the specified thickness. Inspector may witness manufacture and tests of plate at mill and/or he may require that the contractor furnish him mill test reports on each heat from which the plates are rolled. Inspector may also require the contractor to furnish him with specimen plates of the steel that will be used in the manufacture of the pipe.

(c) Specimen plates shall be of the size necessary to obtain the number of specimens required in the plate specification and the tests of the specimens will be furnished by the purchaser. If the specimens fail to meet the requirements of the plate specification under which they were manufactured, a second test will be made, and if all the specimens meet the requirements, the plate will be accepted, but if any of them fail to meet the requirements, all plate furnished under the same heat number will be rejected. The contractor will be charged by the purchaser for all expenses incurred in making a second test.

(d) Inspector's approval of plates shall be obtained before manufacture of any pipe under this specification.

Sect. 3-2.2—Diameter of Pipe

(a) Nominal diameter shall be the inside diameter of the pipe.

(b) Pipe having the following type ends shall be manufactured with an actual outside diameter equal to the specified nominal inside

diameter plus twice the specified thickness of the steel plate, subject to the tolerances in Sect. 3-4.1 of this specification:

1. Ends with slip joints for field welding.
2. Plain ends fitted with butt straps for field welding.
3. Beveled ends fitted with butt straps for field welding.
4. Ends for mechanically coupled field joints.
5. Plain ends fitted with flanges.

(c) Pipe having the following type ends shall have an actual inside diameter equal to the specified nominal inside diameter, subject to the tolerances in Sect. 3-4.1 of this specification:

1. Ends plain or beveled for field butt welding.
2. Bumped ends for riveted field joints.
3. Bell and spigot ends for calked joints.
4. Ends for lap riveted field joints. Nominal inside diameter is the diameter at the smaller end of tapered pipe sections or the inside diameter of the inside sections of inside and outside pipe sections.

Sect. 3-2.3—Length of Sections

All straight pipe sections shall be of the length required by the purchaser and shall be in twenty (20) feet and longer laying length sections. Any completed section of pipe for handling purposes shall not exceed the maximum specified weight as required by the purchaser and in case of conflict with the required length, the weight shall govern and the purchaser shall designate the acceptable length. The purchaser shall have the right to specify shorter lengths, other than full length sections, which may be required for closures and proper location of any special section. Lengths of special sections shall be specified by the purchaser.

Sect. 3-2.4—Ends of Sections

Ends of pipe sections and special sections shall be specified by the purchaser and shall be of any of the following types or as otherwise specified:

(a) Ends with slip joints for field welding.
(b) Ends plain or beveled for field butt welding.
(c) Plain ends fitted with butt straps for field welding.
(d) Beveled ends fitted with butt straps for field welding.
(e) Ends for mechanically coupled field joints.
(f) Ends for riveted field joints.
(g) Bell and spigot ends for calked joints.
(h) Plain ends fitted with flanges.

Sect. 3-2.5—Longitudinal Seams

Longitudinal seams and all spiral seams shall be butt welded. Each pipe section shall have the required number of longitudinal seams as specified by the purchaser.

Sect. 3-2.6—Girth Seams

Shop girth seams shall be butt welded. Each pipe section shall have the required number of girth seams as specified by the purchaser.

Sect. 3-2.7—Special Sections

(a) Curves, tees, branches, and other sections required for changes of alignment or grade which are made up of sections of straight pipe shall have the required type of ends, shall be manufactured from steel plate cut, beveled, and formed to the required shape, or fabricated in accordance with the contractor's approved drawing. When such details are not specified the angular change for welded plate specials shall not exceed $22\frac{1}{2}$ degrees per cut for curves or 45 degrees for branches and wyes and the minimum cord distance between welds for curves shall be not less than twelve (12) inches.

(b) Short straight, transitional, and tapered sections shall have the required type of ends.

Sect. 3-2.8—Adaptors

Saddles, nozzles, or other fittings intended for connection to other pipe lines and structures shall be of the required material and fabricated in accordance with detailed description and/or drawings furnished by the purchaser; or fabricated in accordance with the contractor's approved drawings.

FABRICATION—SECT. 3-3

Sect. 3-3.1—Cutting

All edges cut to size shall be uniform, smooth, and free from scale and slag accumulations. The edges to be welded that are prepared by flame cutting shall be approved by the inspector before any welding.

Sect. 3-3.2—Preparation of Plate Edges

(a) Edges of plates to be joined by an automatic welding machine shall be formed to the shape required for the particular welding process and automatic welding machine to be employed in carrying out

the agreed procedure. Edges of plates to be joined by hand welding shall be formed to the shape required by the purchaser or in accordance with the contractor's approved drawing.

(b) The resulting edges for welding shall be uniform throughout the entire length of the plate and shall be to a straight line.

(c) Special sections having abutting plates of different thicknesses shall have the heavier plate prepared so that the apex of the weld groove shall correspond with that of the lighter plate.

Sect. 3-3.3—Lap Breaking and Rolling

Before the rolling of longitudinal edges all plates shall be lap broken by a continuous rolling operation or in a press having dies that are machined to the proper radius of the pipe shell and the pressure exerted in the lap breaking operation shall be sufficient to secure a true and uniform curve at the edges of the plate. Plates shall then be rolled to the diameters desired. Plates rolled so as to require hammering in order to form the plate into the desired shape will not be accepted. After rolling, all pipe plate shall be inspected for pits or laminations. The inspector may reject all defective plate or permit its being resubmitted for inspection after the use of an approved method of reconditioning.

Sect. 3-3.4—Cleaning of Plate Surfaces to be Welded

All plate edges and surfaces of the plates adjacent to the edges to be welded shall be cleaned of oil, grease, and rust down to bright metal.

Sect. 3-3.5—Fitting Up

No plate shall be fitted up until it has been approved by the Inspector. The plates being welded shall be accurately matched and retained in position during the welding operation. Tack welds may be used to hold the edges in line provided the tack weld thickness will permit the tack weld to become thoroughly fused and a part of the strength weld in the welding operation. The method employed shall result in the finished pipe forming a true circular cross section throughout its whole length.

Sect. 3-3.6—Qualification for Welding Operations

The contractor shall be responsible for the quality of work performed by his welding organization.

(a) All welds produced on automatic welding machines shall meet the test requirements of this specification but this shall not be con-

strued to mean that automatic machine operators shall be qualified as manual welders.

(b) Manual welding operators shall be qualified under Paragraph U-69 of the A.S.M.E. Code for Unfired Pressure Vessels or Paragraph W-451 of the A.P.I.-A.S.M.E. Code for Unfired Pressure Vessels for Petroleum Liquids and Gases or any other code specified by the purchaser.

(c) The inspector shall have the right at any time to call for and witness the making of test specimens by any welder in accordance with this specification and the expense of such tests shall be borne by the contractor.

Sect. 3-3.7—Welding

(a) All welds shall be made by an electric shielded arc method of welding which will completely protect the weld metal deposited from the atmosphere in order to prevent the formation of oxides and nitrides. Welding technique shall be such as to insure a uniform distribution of the load throughout the weld section with no tendency to produce eccentric loading, shear, or distortion in the weld or the metal adjacent thereto. The welding procedure shall be such that at all times there shall be no greater evidence of oxidation in the metal of the weld than in the metal of the unwelded pipe. The ultimate tensile strength of any welded joint shall be not less than the minimum of the specified tensile range of the plate used.

Note: It is suggested that the purchaser make a yield point determination of a welded joint at the beginning of any work under this specification as a check on the quality of weld furnished.

(b) Plates shall be held in the correct position. Abutting edges shall be properly prepared. Each deposited layer of welded metal shall be thoroughly wire brushed and peened before additional welded metal is applied to its surface. Finished weld bead shall be central to the seam and the finished joint shall be free from depressions, undercut edges, burrs, irregularities, and valleys. The inner surfaces of the pipe shall be free from burrs and other irregularities resulting from welding other than the normal bead necessary.

(c) All welds shall be of a type that will produce complete fusion with base metal and shall be free from cracks, oxides, slag inclusions, and gas pockets within the limits set forth under Sect. 3-5.2 (d) of this specification. If the automatic welding machine does not obtain a fusion weld that will penetrate through to the inside of the pipe and protrude beyond the contour of the plate surface an inside pass

shall be made in the root of the groove on the inside of the pipe. Chipping out of the weld in the root of the groove will be required when deemed necessary by the inspector.

(d) If welding is stopped for any reason, special care shall be taken when welding is resumed to obtain complete penetration between welded metal, plate, and welded metal previously deposited and if flux is used it must be redistributed before work is resumed.

(e) The height of the outside weld bead above the contour of the plate surface shall be measured and shall be not more than $\frac{1}{8}$ of an inch. Heights exceeding $\frac{1}{8}$ of an inch shall be removed by grinding or chipping. All longitudinal, spiral, and girth welds on the inside of the pipe shall be ground or chipped down so that the height of weld bead shall be not more than $\frac{1}{16}$ of an inch above the contour of the plate surface. Grinding or chipping of the weld bead below surface of plate will not be permitted.

Sect. 3-3.8—Correction to Welds

(a) Welds found deficient in dimensions but not in quality shall be enlarged by additional welding after thorough cleaning of the surfaces of previously deposited metal and adjoining plate. However, in case work performed since the making of a deficient weld has rendered the weld inaccessible or has caused new conditions which would make such reinforcement dangerous or ineffective, the original conditions shall be restored by removal of welds, members, or both, before enlarging the deficient weld, or else the deficiency shall be compensated by additional work as prescribed by the Inspector.

(b) Welds considered by the inspector to be deficient in quality or made contrary to any mandatory provision of this specification shall be removed by chipping or melting and shall be remade. The weld metal shall be removed throughout its depth to expose clean base metal but in case of a strictly local deficiency the weld need not be removed throughout its entire length provided that sufficient shall be removed to insure that sound weld metal only remain. A cracked weld shall be removed throughout its length, unless the extent of the crack can be ascertained by acid etching or magnetic or other equally positive means, to be limited, in which case any sound weld metal two (2) inches or more beyond either end of the crack need not be removed.

(c) When removing part or all of a weld the cutting or chipping shall not extend into the base metal beyond the depth of weld penetration. Care shall be taken not to burn or otherwise injure the base metal and after the melting operation the exposed base metal shall

be thoroughly cleaned by chipping and wire brushing in preparation for rewelding.

(d) Overheated weld metal and any overheated base metal adjoining same shall be removed and replaced by new weld metal properly applied. However, in case the plate is so badly or extensively injured by overheating that it cannot satisfactorily be replaced by weld metal, the injured plate shall be replaced or the deficiency compensated by additional work as prescribed by the inspector.

Sect. 3-3.9—Automatic Welding

All longitudinal, spiral, and girth seams of straight pipe sections, and special sections when practicable, shall be welded with an automatic welding machine. Hand welding of girth seams will be permitted on extraordinary long straight pipe sections, consisting of more than one standard length, when agreed to by the purchaser and contractor. Sample welds shall be submitted to the inspector for testing in accordance with Sect. 3-5.1 of this specification. Approval of such tests shall be required prior to the welding of pipe.

Sect. 3-3.10—Hand Welding

Hand welding of special sections and adaptors will be permitted when it is impossible to use an automatic welding machine. On straight pipe sections the only hand welding permitted will be that required in tack welding in joining coils and plates in the continuous spiral welding process, making an inside pass on the inside of the pipe, rewelding and repairing structural defects in the plate and automatic machine welds, and as permitted under Sect. 3-3.9 of this specification.

Sect. 3-3.11—Rounding Up of Pipe Sections

Reshaping pipe after it is welded shall be done by rerolling or by pressure. Reshaping of pipe by excessive hammering or dropping will not be permitted.

Sect. 3-3.12—Preparation of Ends of Sections

(a) *Ends with Slip Joints for Field Welding:* Bell ends shall be pressed or rolled to the required shape without hammering. Spigot ends shall be shaped in or over a die. The longitudinal welds on the inside of the bell end and on the outside of the spigot end on each section of pipe shall be ground to plate surface for the slip joint. The inside edge of the bell and the outside edge of the spigot end shall be scarfed or lightly ground sufficiently to remove the sharp edges or burrs in the end of the pipe sections.

(b) *Ends Plain or Beveled for Field Butt Welding:* Ends of pipe sections required for field butt welds either with or without backing up strips or chill rings shall be beveled in accordance with Sect. 3-3.2 of this specification or as otherwise specified.

(c) *Plain Ends Fitted with Butt Straps for Field Welding:* Plain ends of pipe sections fitted with butt straps for field joints shall comply with the details shown on the drawings. Butt straps shall be of the same thicknesses as the corresponding pipe section, shall be of the required width, shall be rolled to fit the outside diameter, and shall be welded to the pipe section. One-half ($\frac{1}{2}$) of the butt strap shall be welded to the upper half of the end of the pipe section and the other half shall be welded to the lower half of the other end of the pipe section, or a complete butt strap may be fully welded to one end of each pipe section which is to be joined in the field by welding to an adjoining section. Longitudinal or spiral welds on the outside of the plain end shall be ground to plate surface a sufficient distance from the end. The inside edge of the butt strap and the outside edge of the adjacent pipe length shall be ground or sufficiently scarfed to remove sharp edges or burrs.

(d) *Beveled Ends of Pipe Sections Fitted with Butt Strap for Field Joints:* Beveled end of pipe sections fitted with butt strap for field joints shall comply with Sect. 3-3.12 (c) of this specification except that the inside ends shall be beveled in accordance with Sect. 3-3.2 of this specification or as otherwise specified.

(e) *Ends for Mechanically Coupled Field Joints:* Ends for mechanically coupled field joints shall be as specified by the purchaser and shall be plain, grooved, or banded. The outside of plain end pipe shall be free from objectionable surface defects and shall have the longitudinal or spiral welds ground to plate surface for a distance of ten (10) inches back from the ends. Grooved or banded ends shall be prepared to fit the type of mechanical coupling to be used.

(f) *Ends for Riveted Field Joints:* Ends for riveted field joints shall be as specified by the purchaser and shall be prepared for bumped joints or lap joints, the latter formed by using tapered pipe sections or inside and outside pipe sections. Plate edges at ends of pipe shall be planed or bevel sheared suitable for field calking. All rivet holes shall be accurately spaced as required and shall be drilled or subpunched and reamed $\frac{1}{16}$ of an inch larger than the nominal size of the rivet. Holes shall be free from burrs and torn or damaged edges.

(g) *Bell and Spigot Ends for Calked Joints:* Bell ends shall be pressed, rolled, or fabricated from plate to the required shape without hammering and at a temperature of not less than 1,500 degrees

Fahrenheit. Spigot ends shall be formed to the required dimensions. Longitudinal or spiral welds on the inside of the bell end and on the outside of the spigot end on each section of pipe shall be ground to plate surface for the joint.

(h) *Plain Ends Fitted with Flanges:* Ends to be fitted with flanges shall have the longitudinal or spiral welds on the pipe ground to plate surface for a distance of six (6) inches from the ends. Flanges shall be of the type and welded on the pipe as specified and/or shown on the drawings.

TOLERANCES—SECT. 3-4

Sect. 3-4.1—Tolerance for Ends

Each section of pipe shall be accurately measured with a steel tape and shall not exceed the tolerances set forth below provided, however, that such tolerances do not interfere with the making of the joints.

(a) For a distance of not less than ten (10) inches from the ends the outside circumference of pipe with the following type of ends shall be not less than $\frac{1}{16}$ of an inch smaller nor more than $\frac{1}{8}$ of an inch greater than the outside circumference computed from the specified nominal inside diameter and the specified plate thickness:

1. Plain ends of slip joint pipe for field welding.
2. Plain ends with butt straps for field welding.
3. Beveled ends fitted with butt straps for field welding.
4. Both ends of inside section of inside and outside pipe sections and/or the smaller end of tapered section for lap riveted field joints.
5. Plain ends fitted with flanges.

(b) Ends for mechanical couplings shall have tolerances within the limits required by the manufacturer of the type of coupling to be employed.

(c) For a distance of not less than ten (10) inches back from the ends the inside circumference of pipe with the following type of ends shall be not less than $\frac{1}{16}$ of an inch smaller nor more than $\frac{1}{8}$ of an inch greater than the inside circumference computed from the nominal inside diameter:

1. Ends plain or beveled for field butt welding.
2. Bumped ends for riveted field joints.
3. Plain end of bell and spigot pipe for calked joints.
4. Ends for riveted field joints. (Tolerance for tapered pipe to apply at the smaller end only.)

(d) The inside diameter of the bell of slip joint pipe for field weld-

ing shall be between $\frac{1}{32}$ of an inch and $\frac{1}{16}$ of an inch greater than the outside diameter of the plain end. The inside diameter of the outside section of inside and outside pipe sections and/or the inside diameter of the larger end of tapered sections for lap riveted field joints shall be between $\frac{1}{16}$ of an inch and $\frac{1}{8}$ of an inch greater than the outside diameter of the inside section or smaller end of the tapered section; such outside diameter shall be determined from the nominal inside diameter and the specified plate thickness.

(e) The out-of-roundness of pipe ends at fabricator's plant when measured on any diameter shall be within limits consistent with the type of field joint specified and the type of corrosion protection to be employed.

(f) The ends of all pipe sections shall not vary more than $\frac{1}{8}$ of an inch at any point from a true plane at right angles to the axis of the pipe.

Sect. 3-4.2—Tolerance for Straightness

The alignment of finished pipe sections shall be truly straight with walls parallel to the axis of the pipe. Any pipe sections with faulty alignment exceeding $\frac{1}{8}$ of an inch for each ten (10) feet in length from a line parallel to the axis of the pipe will be rejected.

Sect. 3-4.3—Tolerance for Length

Length of straight pipe sections shall not vary from the specified length by more than plus or minus two (2) inches. Length of special sections shall not vary from the specified length by more than plus or minus $\frac{1}{8}$ of an inch.

TESTS—SECT. 3-5

Sect. 3-5.1—Weld Test Specimens

(a) Weld test specimens shall be furnished the inspector approximately every 300 lineal feet of pipe and shall be furnished oftener if, in the judgment of the inspector, a satisfactory weld is not being made. Weld specimens may be cut from the pipe along the longitudinal seam, spiral seam, circumferential seam, or test plates welded to ends of pipe sections as may be required by the inspector. The preparation of the edges of the test plates, the welding processes, procedure, and technique shall be the same as used in the fabrication of the pipe.

(b) Test of the specimen plates shall be at the purchaser's expense and such tests shall be performed at the purchaser's laboratory, at a commercial laboratory designated by the purchaser, or at the

contractor's plant if facilities permit. The contractor will be permitted to weld a patch on or insert a patch in the pipe. The patch shall be welded both inside and outside covering the area from which the specimens are cut except where specimens are cut from the end of the pipe the ends of the pipe shall be cut off to the extent necessary.

(c) The test specimen plates shall be of sufficient size to obtain the required test specimens.

(d) Two etch or waste specimens, one reduced section tensile test specimen, one free bend test specimen, one reverse bend test specimen, and one nick break test specimen shall be taken from each test specimen plate. Three-eighths ($\frac{3}{8}$) of an inch clearance shall be left between specimens to permit milling and machining specimens to size. Flame cutting specimens from test specimen plates will not be permitted. Each specimen shall be prepared as follows:

1. *Etch Specimen:* Etch specimen shall be $\frac{1}{2}$ of an inch wide and shall be obtained from each end of the test speciman plate. The etch specimen shall be prepared in accordance with the following:

The two (2) cross-sectional surfaces of the welded joint specimen shall be polished to bright smooth surfaces which may be accomplished by filing and polishing with emery cloth and should be completed with the use of emery cloth of 00 grade. If the specimens have been removed by flame cutting they shall be machined, ground, or filed to a smooth surface by the removal of not less than $\frac{1}{8}$ of an inch of material below the flame cut surface and they shall then be polished as above. The specimens shall then be etched in a boiling solution of equal parts of hydrochloric acid and water for a sufficient period of time to reveal all lack of soundness that might exist at the cross-sectional surfaces of the specimen.

2. *Reduced Section Tensile Test Specimen:* Reduced section tensile test specimen shall be of the size and dimensions shown in Figure 1 of the appendix of this specification, entitled "Reduced-Section Test Specimen."

3. *Free Bend Test Specimen:* Free bend test specimen shall be of the shape and dimensions shown in Figure 2 of the appendix of this specification, entitled "Free Bend Test" and the testing shall be in accordance with the following:

The free-bend-test specimens shall be bent transversely to the welded joint with the wider portion of the weld surface on the outside of the bend. The bend in this specimen may be started

by holding the specimen in a vise about $\frac{1}{3}$ from the end, producing an initial bend at this point with hammer blows. Another bend about $\frac{1}{3}$ from the other end may be produced in the same manner. The specimen with the initial bend at each end and at atmospheric temperature is then placed as a strut in a vise or compression machine and the pressure applied gradually (that is, without shock) at the ends until failure occurs in the outside fibers of the bend specimen. When a crack is observed in the convex surface of the specimen between the edges, the specimen shall be considered to have failed and the test shall be stopped. Cracks at the corners of the specimen shall not be considered as a failure. The appearance of small defects in the convex surface shall not be considered as a failure if their greatest dimension does not exceed $\frac{1}{16}$ of an inch.

4. *Reverse Bend Test Specimen:* Reverse bend test specimen shall be of the shape and dimensions as shown in Figure 3 of the appendix of this specification, entitled "Reverse Bend Test" and the testing shall be in accordance with the following:

The reverse-bend-test specimen for single-welded butt joints without backing-up strip shall be bent around a pin or mandrel whose diameter is equal to the thickness of the specimen and through an angle of at least 30 degrees.

5. *Nick Break Test Specimen:* The nick break test specimen shall be of the shape and dimensions of the butt weld as shown in Figure 4 of the appendix of this specification, entitled "Standard Bar for Nick Break Tests." The nick break specimen shall be suitably supported and broken in the center of the weld by a sharp blow or blows of a hammer.

Sect. 3-5.2—Results of Weld Tests

The minimum requirements for the test results are as follows:

(a) *Reduced Section Tensile Test:* Yield point and the ultimate tensile strength shall be not less than the minimum of the specified tensile range of the plate used.

(b) *Free Bend Test:* The elongation shall be measured within or across approximately the entire weld on the outside of the fibers of the test specimen and shall be at least twenty (20) per cent. The widths of any surface crack shall be deducted.

(c) *Reverse Bend Test:* There shall be no defects due to lack of fusion between weld metal and plate and there shall be no cracks other than small surface cracks.

(d) *Nick Break Test:* The fracture shall show complete penetration

through the entire thickness of the weld, an absence of oxide or slag inclusions, and a degree of porosity not to exceed six (6) gas pockets per square inch of the total area of the weld surface exposed in the fracture, the maximum dimension of any such pocket not to be in excess of $\frac{1}{16}$ of an inch.

Sect. 3-5.3—Retests of Welds

Retests of welds shall be in accordance with the following:

(a) If any tests fail to meet any of the requirements described in Sect. 3-5.2 of this specification, two (2) additional test specimen plates shall be cut from the pipe section from which the original specimen plate was obtained and retests shall be made on these additional specimens.

(b) Should any of the tests made from the second test specimen plates fail to meet the requirements prescribed in Sect. 3-5.2 of this specification, all pipe sections in the lot represented by the pipe section whose retest failed, as determined by the inspector, will be rejected. All pipe sections in this lot, other than the pipe section from which the test specimens were obtained, may be reconditioned and resubmitted for inspection. The inspector may require as many specimen plates as he desires from this lot and all tests shall meet the requirements of Sect. 3-5.2 of this specification or all pipe sections in this lot will be rejected. The inspector may require that the welding operator whose retest failed shall not be permitted to perform any further welding required under this specification. The contractor will be charged by the purchaser for all expenses incurred in making retests.

Sect. 3-5.4—Hydrostatic Test of Pipe

All pipe sections and special sections shall be subjected to a hydrostatic test of the required pressure and shall be in accordance with the outlined procedure set forth below.

(a) *Straight Pipe Sections and Tapered Sections:* Each straight pipe section and tapered section whose ends are in planes at right angles to their pipe axis shall be tested hydrostatically in a testing machine to a test pressure two (2) times the specified working water pressure (including allowance for water hammer); however, such test pressure shall not exceed that determined by the following formula:

$$P = \frac{2st_1}{D}$$

where

P = Pressure in pounds per square inch.

s = Allowable fiber stress in pounds per square inch which shall be equal to 80 per cent of the yield point of the specified plate but shall not exceed 22,000 pounds per square inch.

t_1 = Wall thickness of pipe in inches required for the specified working water pressure.

D = Outside diameter in inches of straight pipe section and the larger outside diameter of tapered sections unless otherwise specified.

(b) *Bends, Branch Connections, and Special Sections:* All bends, branch connections, and other special connections shall be subjected to a hydrostatic test pressure specified by the purchaser. Sections that cannot be tested in a testing machine may be prepared for testing by welding on heads, or as otherwise approved by the engineer, and after testing the ends shall be reconditioned.

Note: It is recommended that the maximum test pressure for all bends, branch connections, and special sections shall not exceed 1½ times the working water pressure.

(c) *Procedure:* Vents shall be provided at all high points of the pipe to prevent the formation of air pockets while the pipe is being filled and before applying the pressure the equipment shall be inspected to see that it is tight. The required pressure shall be held for five (5) minutes and while under pressure the welded seams shall be inspected for leaks and each leak shall be marked plainly. In this test no hammering will be permitted. Any section showing more than one (1) leak for each five (5) feet of welded seam or more than 2½ per cent of the total length of welded seam will be rejected. Closing leaks by means of calking tool will not be permitted. The sections showing less than one (1) leak for each five (5) feet of welded seam and not more than 2½ per cent of the total length of the welded seam shall have the leaks repaired by chipping the weld and rewelding by hand, after which the pipe shall be retested hydrostatically in a duplicate manner. On a retest the pipe section shall show no leaks in the welded seams and if any appear the section will be rejected. Accepted pipe sections shall be stamped after test by the Inspector with some legible mark of identification.

CLEANING, SAND BLASTING, AND COATING PIPE SURFACES—SECT. 3-6

Sect. 3-6.1—Cleaning—If not Otherwise Specified by Purchaser

Each section of pipe shall be thoroughly cleaned both inside and outside of loose mill scale, paint, grease, oil, and other foreign sub-

stance, including all burned flux or molten material outside of the weld proper. Method and material used in cleaning shall be approved by the inspector.

Sect. 3-6.2—Sand Blasting and Coating of Pipe

The material used and the procedure followed in sand or shot blasting, priming and enameling, or painting of surfaces of pipe sections shall be in accordance with the purchaser's supplementary specification.

DELIVERY—SECT. 3-7

Sect. 3-7.1—Marking

Each section of pipe and each special section shall have conspicuously painted in white on the inside the date of manufacture and a serial number for identification. Where the pipes are coated such marking shall be done at the shop and later transferred to the inside coating. The contractor may be required to furnish the engineer with field sketches showing where each numbered pipe or special section goes in the line and the numbers on such sections shall correspond with those painted on the pipes and special sections.

Sect. 3-7.2—Delivery of Pipe

Pipe sections and special sections shall be delivered in the order required and shall be loaded and/or unloaded as required by the purchaser.

Sect. 3-7.3—Finished Pipe at Delivery Destination

(a) Any pipe section or special section that shows dents, kinks, abrupt changes of curvature other than specified, and injuries at the f.o.b. delivery destination may be rejected. Any pipe section or special section that has been dropped from a truck or crane prior to completion of delivery will be rejected. The contractor shall replace, at his own expense, such rejected section with an undamaged section or he may recondition the rejected section.

(b) Rejected section showing dents, kinks, and abrupt changes in curvature shall be reconditioned by rerolling or by pressure but not by hammering and shall be retested hydrostatically to the required pressure if deemed necessary by the inspector. Rejected sections showing injuries shall be reconditioned in a manner prescribed by the inspector. Sections dropped from truck or crane shall be reconditioned as stated above and shall be retested hydrostatically to the required pressure.

APPENDIX

STRESS RELIEVING AND RADIOGRAPHING—SECT. A3-1

Sect. A3-1.1—General

In connection with the fabrication of electric fusion welded pipe, stress relieving and radiographing are required only in very exceptional instances. Therefore, references to these have been included as an appendix.

If thermal stress relieving or radiographing is required the purchaser shall state to what extent these operations are to be performed, and unless this information is specifically stated, the paragraphs given in this appendix relative to stress relieving and radiographing will not be considered as applying to the pipe fabrication.

When unusually high heads, large diameters, or a combination of these and other special conditions result in heavy plate thicknesses and, in the opinion of the purchaser, the additional expense of stress relieving, or radiographing, or both, is justified, these operations shall comply with the following paragraphs:

Sect. A3-1.2—Thermal Stress Relieving

Stress relieving of pipe and special sections shall be performed in accordance with Paragraph W-462 of the A.P.I.-A.S.M.E. Code, Unfired Pressure Vessels for Petroleum Liquids and Gases, as last revised.

Sect. A3-1.3—Radiographic Tests of Welds

All welds of pipe sections and special sections shall pass radiographic tests, and the procedure for obtaining radiographs, the interpretation of results, and the acceptance of welds shall be in accordance with Paragraph W-524 of the A.P.I.-A.S.M.E. Code, Unfired Pressure Vessels for Petroleum Liquids and Gases, as last revised.

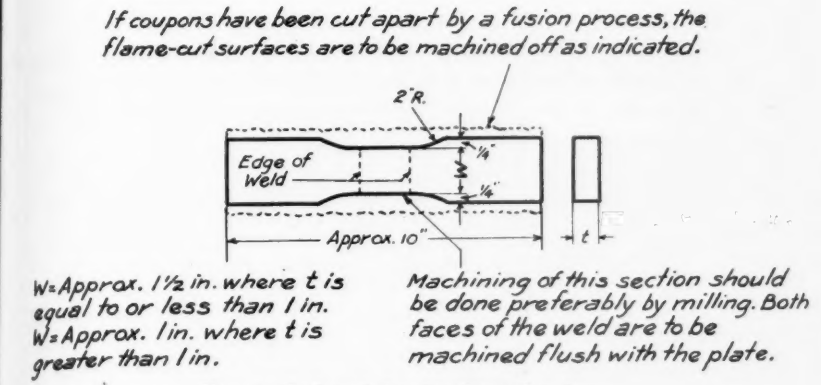
If coupons have been cut apart by a fusion process, the flame-cut surfaces are to be machined off as indicated.
2" R.
Edge of Weld
1/4"
1/4"
Approx. 10"
t
W = Approx. 1 1/2 in. where t is equal to or less than 1 in.
W = Approx. 1 in. where t is greater than 1 in.
Machining of this section should be done preferably by milling. Both faces of the weld are to be machined flush with the plate.

FIG. 1. Reduced-Section Test Specimen

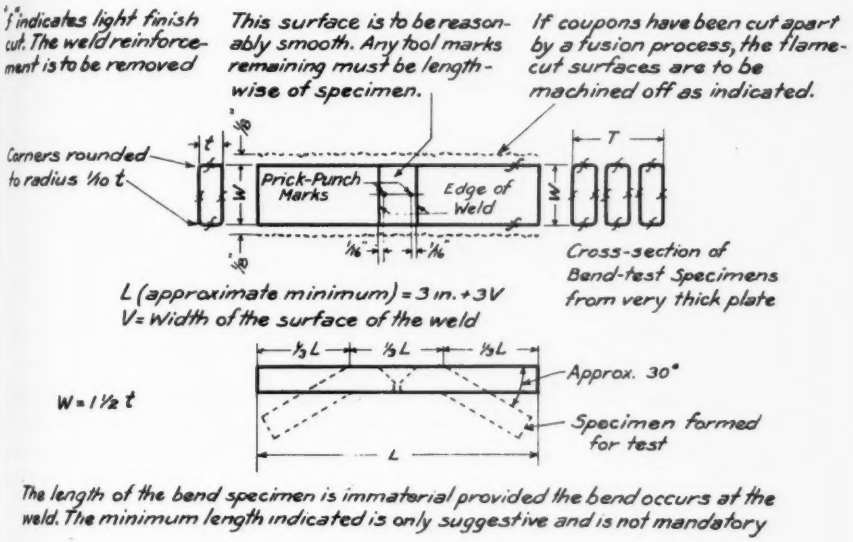
"f" indicates light finish cut. The weld reinforcement is to be removed
This surface is to be reasonably smooth. Any tool marks remaining must be lengthwise of specimen.
If coupons have been cut apart by a fusion process, the flame-cut surfaces are to be machined off as indicated.
Corners rounded to radius 1/10 t
t
1/10
W
Prick-Punch Marks
Edge of Weld
T
1/16"
1/16"
1/10
Cross-section of Bend-test Specimens from very thick plate
L (approximate minimum) = 3 in. + 3V
V = Width of the surface of the weld
1/3 L
1/3 L
1/3 L
Approx. 30°
W = 1 1/2 t
Specimen formed for test
L
The length of the bend specimen is immaterial provided the bend occurs at the weld. The minimum length indicated is only suggestive and is not mandatory

FIG. 2. Free-Bend Test

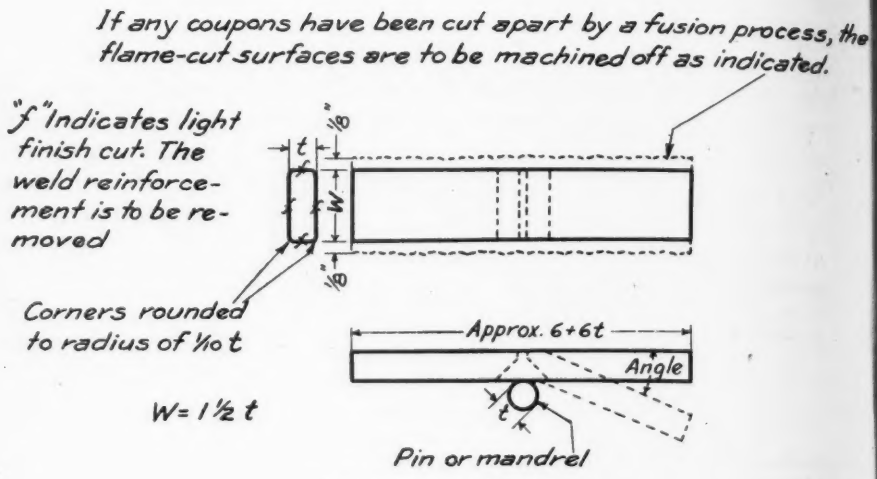
If any coupons have been cut apart by a fusion process, the flame-cut surfaces are to be machined off as indicated.
"f" Indicates light finish cut. The weld reinforcement is to be removed
Corners rounded to radius of 1/10 t
W = 1 1/2 t
Approx. 6+6t
Angle
Pin or mandrel

FIG. 3. Reverse-Bend Test

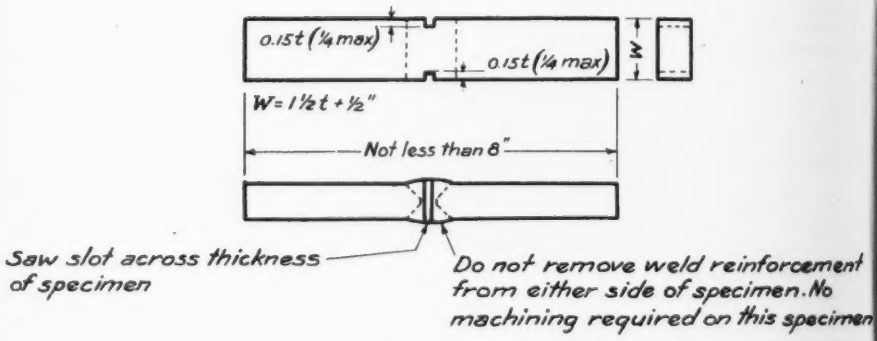
0.15t (1/4 max)
0.15t (1/4 max)
W = 1 1/2 t + 1/2"
Not less than 8"
Saw slot across thickness of specimen
Do not remove weld reinforcement from either side of specimen. No machining required on this specimen

FIG. 4. Standard Bar for Nick-Break Tests

Tentative Standard

American Water Works Association

SPECIFICATIONS

for

STEEL WATER PIPE OF SIZES OF 4 INCHES UP TO BUT NOT INCLUDING 30 INCHES

The American Water Works Association has adopted and promulgates these "Tentative Standard Specifications for Steel Water Pipe of Sizes of 4 Inches up to but Not Including 30 Inches." They are based upon the best known experience and intended for use under normal conditions. They are not designed for unqualified use under all conditions and the advisability of use of the material herein specified for any installation must be subjected to review by the engineer responsible for the construction in the particular locality concerned.

Approved by the Board of Directors of the A. W. W. A.
April 25, 1940

Prepared by

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Acknowledgment is made and appreciation expressed to Harry Hayes, Assistant Engineer in charge of the Protective Pipe Coating Laboratory and the Specification Section, Bureau of Water Works and Supply of the Department of Water and Power of the City of Los Angeles, and to the Manufacturing Technical Advisory Committee to Subcommittee 7A Steel Plate Pipe of the American Water Works Association, for their assistance and cooperation in the preparation of these specifications.

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Sect. A4-3.1—Steel Pipe for Underground Water Service

TENTATIVE STANDARD SPECIFICATIONS FOR STEEL WATER PIPE

OF SIZES OF 4 INCHES UP TO BUT NOT INCLUDING 30 INCHES

GENERAL—SECT. 4-1

Sect. 4-1.1—Scope

(a) These specifications cover steel pipe intended for the conveyance of water, in sizes of 4 inches up to but not including 30 inches in diameter, and in random, double random or specified laying lengths, straight sections, or other special sections which are required for closures, curves, changes in alignment or grade to meet special conditions and with ends prepared for type of joint specified. The manufacturer or bidder shall state to the purchaser the type of pipe manufacture he proposes to use in the production of *mill* pipe or details of the procedure he proposes to use in the manufacture of *fabricated* pipe and special sections. This manufacturing procedure shall comply with the specifications given hereinafter unless otherwise agreed to by the engineer, purchaser, or authorized inspector during the progress of the work.

(b) The pipe covered by these specifications is manufactured by the following processes and in the nominal size ranges indicated in wall thicknesses and weights as covered by the table which is Sect. A4-3.1 in the Appendix.

Mill Pipe:

Seamless in sizes 4-inch to 24-inch inclusive.

Lap-welded in sizes 4-inch to 20-inch inclusive.

Electric-welded:

Resistance-welded in sizes 4-inch to but not including 30-inch.

Fusion-welded:

Straight-seam in sizes 4-inch to but not including 30-inch.

Spiral-seam in sizes 4-inch to but not including 30-inch.

Fabricated Pipe:

Electric-fusion-welded:

Straight-seam in sizes 4-inch to but not including 30-inch.
Spiral-seam in sizes 4-inch to but not including 30-inch.

Sect. 4-1.2 – Supplementary Details to Be Provided by Purchaser

When purchasing pipe under these specifications, it will be necessary for the purchaser to make supplementary specific statements in his call for bids regarding the following:

(a) Outside diameter.

(b) Wall thickness.

(c) Nominal weight per foot.

(d) When a particular class of pipe as listed in Table 1 in Sect. A4-3.1 is required, it shall be so stated; otherwise all classes shall be considered equal alternates.

(e) Detailed description of the type of pipe ends with all drawings necessary to show shape, width, thickness, beveling, or other details. Types of pipe ends are indicated in Sect. 4-2.7 of these specifications.

(f) Lengths (random, double-random, or specified).

(g) The maximum number of longitudinal and girth seams permitted in each *fabricated* pipe section or the maximum number of lengths of *mill* pipe joined in accordance with Sect. A4.2 in the Appendix to these specifications.

(h) The maximum working water pressure including water hammer allowance.

(i) Detailed description and drawings of all special sections and special fittings, indicating for each component part the dimensions, the grade of material, the type of ends, and the hydrostatic test pressure.

(j) Kind of corrosion protection and whether to be applied in the field or at the mill. (Complete details of the coating to be applied, whether the pipe is to be completely coated from end to end, or if a certain specified distance at the end shall be left bare, or be oil varnished, or painted with designated material either for field welding or to accommodate mechanical-type couplings.)

Sect. 4-1.3—Definitions

Under these specifications the definitions given in Sect. A4-1.1 of the Appendix will apply.

Sect. 4-1.4—Inspection

(a) If desired by the purchaser, all work and material under these specifications may be inspected by his representative during all phases of manufacture and testing.

(b) When the pipe sizes and wall thicknesses of *mill* pipe fall

within the ranges commonly carried in mill stocks, the purchaser's inspector is authorized to accept the manufacturer's certified statement of the *hydrostatic* and *flattening tests* which if they have met the requirements of these specifications, shall be accepted in lieu of similar tests required by these specifications. All other tests shall be made as required by these specifications.

(c) However, the purchaser may elect to waive his inspection and accept instead a certified statement from the manufacturer that the required inspection and tests have been made.

(d) When specifically requested the manufacturer shall also furnish certified copy of laboratory tests showing chemical and physical properties. The manufacturer shall notify the purchaser in advance of the production in order that the purchaser may arrange for mill and shop inspection.

(e) The inspector may reject any or all pipe sections or special sections that do not meet the requirements of these specifications and the purchaser's supplementary instructions. It is understood that inspection either by the purchaser's inspector or by the mill shall not relieve the manufacturer of his responsibility to furnish material and to perform work in accordance with these specifications.

(f) At all times while work on the contract of the purchaser is being performed, the inspector shall have free entry to all parts of the manufacturer's works which concern the manufacture of the pipe ordered. The manufacturer shall afford the inspector, without charge, all reasonable facilities to satisfy him that the pipe is being furnished in accordance with these specifications. All tests and inspections shall be made at the place of manufacture prior to shipment and shall be so conducted as not to interfere unnecessarily with the operation of the works.

Sect. 4-1.5—Inspectors

Inspectors shall be qualified by experience, shall be familiar with the class of pipe being purchased and the manufacturing processes for producing it, and shall be capable of making such examinations and measurements as are necessary in determining whether or not the pipe being purchased conforms to the requirements of these specifications.

Sect. 4-1.6—Material and Workmanship

(a) All material furnished by the manufacturer shall be of the specified quality. All work shall be done in a thoroughly workmanlike manner.

(b) When the depth of defect is in excess of 12.5 per cent of the nominal wall thickness, such defect shall be considered injurious.

(c) The welding of injurious defects in the plate or pipe wall, provided their depth does not exceed $\frac{1}{3}$ the specified wall thickness, will be permitted. Minor defects in the welds of electric-welded pipe, such as sweats or leaks, unless otherwise specified shall be repaired at the discretion of the manufacturer with the approval of the inspector. Repairs of this nature shall be made by completely removing the defect, cleaning the cavity and then welding. The workmanship involved in the repair is subject to approval of the inspector. The hydrostatic test specified in Sect. 4–5.7 shall be made on the finished repaired pipe.

Sect. 4-1.7—Equipment—General Provisions

Manufacturer's equipment for all fabricated pipe, such as for welding, flame cutting and other operations shall be of a standard and quality necessary to produce pipe meeting these specifications. Equipment in general shall be in good repair and shall be modern as judged by the standards of the industry.

Sect. 4-1.8—Drawings

Drawings referred to in these specifications shall be the purchaser's drawings.

Sect. 4-1.9—Testing

Pipe sections and special sections shall be tested as required herein.

DESCRIPTION OF PIPE—SECT. 4-2

Sect. 4-2.1—Classes of Pipe

Classes of pipe covered by these specifications are given in Table 1 herewith.

TABLE 1

Classes of Pipe

MILL PIPE			FABRICATED PIPE
Furnace-Welded Pipe	Electric-Welded Pipe	Seamless Pipe	
Lap-Welded	Resistance-Welded Fusion-Welded (a) Straight Seam (b) Spiral Seam	Seamless	Fusion-Welded (a) Straight Seam (b) Spiral Seam

Sect. 4-2.2—Chemical Properties of Steel

(a) The steel for *mill* pipe shall be of good welding quality and may be made by the acid bessemer process or the open hearth process and shall conform to the requirements as to chemical composition given in Table 2 herewith.

(b) Steel plate for *fabricated* pipe shall conform to the chemical requirements of Grade B plates called for by A.S.T.M. Standard A 78 of latest revision (Steel Plates of Structural Quality for Forge Welding) and specified for fusion welding, or as otherwise specified by the purchaser.

Sect. 4-2.3—Check Analysis

(a) Analysis of one length of pipe from each lot of 200 lengths or fraction thereof of each size 4 inches to 20 inches, inclusive, and of one length from each lot of 100 lengths or fractions thereof, of each size 22 inches and larger, inclusive, may be made by the inspector

TABLE 2

Chemical Properties

ELEMENT	BESSEMER	OPEN HEARTH
	per cent	*per cent*
Manganese, not under	0.30	0.30
Phosphorus, not over	0.11	0.045
Sulfur, not over	0.065	0.06

from the finished pipe. However, by agreement between the manufacturer and the inspector, the analysis may be taken from the skelp or plate and when so taken, the number of analyses shall be determined in the same manner as when taken from the finished pipe.

(b) If the analysis does not conform to the requirements specified, analyses of two additional lengths from the same lot shall be made, each of which shall conform to the requirements specified. If the result of both analyses of any lot does not conform to the requirement specified, the lot shall be rejected. However, the manufacturer may, at his option, submit each length of said lot for retest.

(c) Drilling for analyses shall be taken from several points around each length of pipe or across each length of skelp or plate selected for test.

(d) By agreement between the purchaser or his authorized inspector and the manufacturer, ladle analyses of each heat of steel

may be furnished in lieu of check analyses as specified in Sect. 4–2.3 (a).

Sect. 4-2.4—Physical Properties and Tests

(a) The steel for *mill* pipe shall conform to the minimum longitudinal tensile properties as specified in Table 3.

(b) Steel plate used in *fabricated* pipe shall conform to the tensile properties specified for Grade B plates by A.S.T.M. Standard A 78 of latest revision (Steel Plates of Structural Quality for Forge Welding) and specified for fusion welding, or as otherwise specified by the purchaser.

(c) Specimens cut longitudinally from the pipe shall be acceptable for the tension test. The tension test specimen shall consist of a strip cut from either end of the pipe. The tension test specimens for *fabricated* pipe may be taken from the skelp or plate.

TABLE 3

PROPERTY	BESSEMER LAP-WELDED	OPEN HEARTH	
		Lap-Welded	Seamless or Electric-Welded
Tensile Strength, lb. per sq.in.	50,000	45,000	48,000
Yield Point, lb. per sq.in.	30,000	25,000	30,000
Elongation in 8 in. per cent	18	22	—
Elongation in 2 in. per cent	—	—	30

(d) The test specimens for *mill* pipe shall have a strip width within the gage length of $1\frac{1}{2}$ inches and not flattened between gage marks. When grips with suitable curved faces are not available the ends of the specimens may be flattened cold. The strip shall have a gage length of 2 inches or 8 inches as called for in Table 3. The sides shall be parallel between gage marks. The specimens from welded pipe shall be taken from a point approximately 90 degrees from the weld. The specimen taken from the skelp or plate shall be cut longitudinally with the longitudinal axis located approximately midway between the center and the edge of the skelp or plate.

(e) The yield point shall be determined by the drop of the beam or halt of the gage of the testing machine by dividers or other approved method. (NOTE: For the required number of tension tests, hydrostatic tests, and physical tests of welded joints see Sect. 4–5—Tests.)

Sect. 4-2.5—Diameter of Pipe

(a) The diameter of pipe shall be as specified in the call for bids and shall be designated by outside diameter. Sect. A4–3.1 in the Appendix is a list of representative sizes and wall thicknesses.

(b) It shall be understood that the specified diameter is subject to the tolerances given in these specifications.

Sect. 4-2.6—Length of Sections

(a) Straight pipe sections shall be of the length specified and subject to the length tolerances in accordance with these specifications

(b) Length of sections of *mill* pipe shall be designated by random lengths, double-random lengths, or by definite dimension (specified length).

(c) Length of sections of *fabricated* pipe shall be designated by definite length dimension (specified length).

(d) When "specified lengths" are ordered, the purchaser shall have the right to order additional shorter lengths other than full length sections, which may be required for closures or proper location of any special section. Lengths of special sections shall be specified by the purchaser.

(e) For sizes up to and including 24 inches in outside diameter, random lengths (approximate average 20 feet) of lap-welded, electric-welded, and seamless pipe shall be not less than 16 feet. Unless otherwise specified, 5 per cent of lengths may be furnished 12 to 16 feet.

(f) For sizes up to and including 24 inches in outside diameter, double-random lengths (approximate average, 40 feet) shall be not less than 32 feet. Unless otherwise specified, 5 per cent of lengths may be furnished 24 to 32 feet. Double-random lengths may be furnished in single lengths or by welding together two random lengths in accordance with Sect. A4–2 in the Appendix.

(g) For sizes over 24 inches in outside diameter, electric-welded *mill* pipe shall be furnished in lengths approximately 30 feet or over. Unless otherwise specified, 5 per cent of the lengths may be furnished 24 to 30 feet.

Sect. 4-2.7—Ends of Sections

Ends of pipe sections and special sections shall be specified by the purchaser and shall be of any of the following types more fully described in Sect. 4–3.9.

(a) Ends for mechanically coupled field joints.

(b) Ends with slip joints for field welding.

(c) Plain ends or beveled ends for field butt welding.

(d) Plain ends fitted with butt straps for field welding.

(e) Beveled ends fitted with butt straps for field welding. (Applies to sizes 24 inch and over.)

(f) Ends for riveted field joints.

(g) Bell and spigot ends for calked joints.

(h) Plain ends fitted with flanges.

FABRICATION—SECT. 4-3

Sect. 4-3.1—Longitudinal Seams

The longitudinal seams of electric resistance welded pipe, of electric fusion welded *mill* pipe whether straight seam or spiral seam, and of *fabricated* pipe shall be butt welded. Each section of *fabricated* pipe shall have not more than the maximum number of longitudinal seams specified by the purchaser.

Sect. 4-3.2—Girth Seams

(a) Shop girth seams shall be butt welded. Each section of *fabricated* pipe shall have not more than the number of girth seams specified by the purchaser.

(b) Requirements for circumferential welding of straight lengths of *mill* pipe shall be in accordance with Sect. A4–2 in the Appendix of these specifications.

Sect. 4-3.3—Special Sections

(a) Curves, tees, branches, and other sections requiring changes of alignment or grade which are made up from sections of straight pipe shall have the required type of ends, shall be designed in accordance with the purchaser's requirements, or fabricated in accordance with the drawings. When such details are not specified, the angular change for welded plate specials shall not exceed $22\frac{1}{2}$ degrees for cuts for curves or 45 degrees for branches for wyes.

(b) Short straight transitional and tapered sections shall have the required type of ends as specified by the purchaser.

Sect. 4-3.4—Adapters

Saddles, nozzles, or other fittings intended for connection to other pipe lines and structures shall be of the required material and fabricated in accordance with detailed description and drawings furnished by the purchaser or fabricated in accordance with the drawings.

Sect. 4-3.5—Cutting

All edges cut to size shall be uniform and smooth. Those edges to be welded that are prepared by flame cutting shall be free from scale and slag accumulations.

Sect. 4-3.6—Shaping of Plate Edges for Fabricated Pipe

(a) Edges of plates to be joined by an automatic welding machine shall be formed to the shape required for the particular welding process and automatic welding machine to be employed in carrying out the agreed procedure. Edges of plates to be joined by hand welding shall be beveled to the shape required by the purchaser or in accordance with the drawings. The resulting edges for welding shall be uniform throughout the entire length of the plate and shall be to a straight line.

(b) Special sections having abutting plates of different thicknesses shall have the heavier plate sufficiently beveled so that the apex of the weld groove shall correspond with that of the lighter plate.

Sect. 4-3.7—Operations on Fabricated Pipe

All lap breaking, rolling, cleaning of plate surfaces to be welded, and fitting-up operations, as well as the qualification of the welding operators, welding procedure, automatic welding, hand welding, and correction of welds in *fabricated* pipe, shall be in accordance with requirements of the American Water Works Association Standard Specifications for Electric Fusion-Welded Steel Water Pipe of Sizes 30 Inches and Over (7A.3–1940).

Sect. 4-3.8—Rounding up of Pipe Sections

Reshaping pipe after it is manufactured shall be done by rerolling or by pressure. Reshaping of pipe by excessive hammering or dropping will not be permitted.

Sect. 4-3.9—Preparation of Ends of Sections

(a) *Ends for Mechanically Coupled Field Joints:*

Ends for mechanically coupled field joints shall be as specified by the purchaser and shall be plain, grooved, or banded. The outside of plain end pipe shall be free from visible surface defects and shall have the longitudinal or spiral weld beads ground to plate surface for a distance of eight (8) inches back from the ends. Grooved or banded ends shall be prepared to fit the type of mechanical coupling to be used.

(b) *Ends with Slip Joints for Field Welding:*

Bell ends shall be pressed or rolled to the required shape without hammering. Spigot ends shall be shaped in or over a die. Any longitudinal weld beads on the inside of the bell end and on the outside of the spigot end on each section of *fabricated* pipe shall be ground to plate surface for the slip joint. The inside edge of the bell and the outside edge of the spigot end shall be scarfed or lightly ground sufficiently to remove the sharp edges or burrs in the end of the pipe sections.

(c) *Ends Plain or Beveled for Field Butt Welding:*

Ends of pipe sections, when thickness is $\frac{1}{4}$ inch or greater, required for field butt welds either with or without backing up strips or chill rings shall be beveled. The standard bevel for ends for field welding is $37\frac{1}{2}$ degrees measured from a line drawn perpendicular to the axis of the pipe. If other than this standard bevel is desired, the angle thus measured should be so specified.

(d) *Plain Ends Fitted with Butt Straps for Field Welding:*

Plain ends of pipe sections fitted with butt straps for field joints shall comply with the details shown on the drawings. Butt straps shall be of the same thickness as the corresponding pipe sections, shall be of the required width, shall be rolled to fit the outside diameter, and shall be welded to the pipe section. Longitudinal or spiral weld beads on the outside of the plain end shall be ground to plate surface a sufficient distance from the end. The inside edge of the butt strap and the outside edge of the adjacent pipe length shall be ground or sufficiently scarfed to remove sharp edges or burrs.

(e) *Beveled Ends of Pipe Sections 24 Inches and Over in Diameter, Fitted with Butt Strap for Field Joints:*

Beveled end of pipe sections fitted with butt strap for field joints shall comply with Sect. 4–3.9 (d) except that the inside ends shall be beveled in accordance with Sect. 4–3.6 or as otherwise specified, and the butt strap may be thinner than the pipe wall, but not less than $\frac{1}{8}$ inch thick.

(f) *Ends for Riveted Field Joints:*

Ends for riveted field joints shall be as specified by the purchaser and shall be prepared for bumped joints, butt-strap joints, or lap joints, the latter formed by using tapered pipe sections or inside and outside pipe sections. Plate edges at ends of pipe shall be planed or bevel sheared suitable for field calking. Rivet holes shall be accurately spaced as required and shall be drilled or sub-punched and reamed $\frac{1}{16}$ inch larger than the nominal size of the rivet. Holes shall be free from burrs and torn or damaged edges.

(g) *Bell and Spigot Ends for Calked Joints:*

Bell ends may be pressed or rolled or fabricated hot or cold from plate into the required shape without hammering. Spigot ends shall be formed to the required dimensions. Longitudinal or spiral weld beads on the inside of the bell end and on the outside of the spigot end on each section of pipe shall be ground to plate surface for the joint.

(h) *Plain Ends Fitted with Flanges:*

Ends to be fitted with flanges shall have the longitudinal or spiral weld beads on the pipe ground to plate surface for a distance of at least one inch greater than the hub depth of the flange to be attached. Flanges shall be of the type and welded on the pipe as specified or as shown on the drawings.

TOLERANCES—SECT. 4-4

Sect. 4-4.1—Mill Pipe Tolerances

(a) *Diameter:*

The outside diameter of pipe shall not vary more than 1 per cent over or under the size specified, except that the diameter at ends shall be as specified in Sect. 4-4.1 (f) paragraph 3.

(b) *Wall Thickness:*

The minimum wall thickness at any point shall be not more than 12.5 per cent under the nominal wall thickness specified.

(c) *Weight:*

1. The weight of any length shall not vary more than 5.0 per cent under or 10.0 per cent over that specified, but the carload weight shall not be more than 1.75 per cent under the nominal weight.

2. Unless otherwise agreed upon, pipe sections shall be weighed separately.

(d) *Length:*

1. For all classes of pipe when ordered to a specified length, the tolerance shall be plus or minus $\frac{1}{8}$ inch.

2. For specials such as elbows, wyes, tees, reducers, closure pieces, etc., the length tolerance shall be as agreed upon by the purchaser and manufacturer.

(e) *Straightness:*

1. Finished pipe which is not spun enamel lined by the centrifugal casting process shall be commercially straight.

2. When finished pipe is to receive a spun enamel lining applied by the centrifugal casting process and the spinning equipment does not hold pipe in axial alignment, any free pipe sections with

faulty alignment exceeding $\frac{1}{8}$ of an inch for each ten (10) feet in length from a line parallel to the axis of the pipe shall be straightened.

(f) *Ends:*

1. Plain end pipe for use with the mechanical type coupling shall have square cut or beveled ends and the inside and outside edge burrs shall be removed. The pipe shall also be sufficiently free from indentations, projections, or roll marks for a distance of 8 inches from each end to make a tight joint with the rubber gasket.

2. Beveled end pipe for field welding shall be beveled on the outside or on the inside as specified to an angle of $37\frac{1}{2}$ degrees with an average width of flat (root face) at the end of the pipe of $\frac{1}{16}$ inch with a tolerance of plus or minus $\frac{1}{32}$ inch. When pipe ends are ordered beveled to a $37\frac{1}{2}$-degree angle or any other angle, it should be understood that the angle is measured from a line drawn perpendicular to the axis of the pipe. This means that a greater amount of material is removed with a 60-degree angle than with a $37\frac{1}{2}$-degree angle.

3. All plain end pipe intended for either the mechanical type coupling (compression type) or for field welding on sizes $10\frac{3}{4}$ inches in outside diameter and under shall be not more than $\frac{1}{64}$ inch smaller than the specified outside pipe diameter for a distance of 8 inches from each end and shall permit the passing for a distance of 8 inches of a ring gage which has a bore $\frac{1}{16}$ inch larger than the specified outside diameter of the pipe. Sizes 12 inches and larger in outside diameter shall not be more than $\frac{1}{32}$ inch smaller than the specified outside pipe diameter for a distance of 8 inches from each end and shall permit the passing for a distance of 8 inches of a ring gage which has a bore of $\frac{3}{32}$ inch larger than the specified outside diameter of the pipe.

4. Ends for other type mechanical couplings shall have tolerances within the limits required by the manufacturer of the type of coupling to be employed.

5. Tolerances for other types of joints shall be in accordance with Sect. 4–4.2 where applicable.

Sect. 4-4.2—Fabricated Pipe-Tolerances

(a) *Diameter, Ends:*

1. Each section of pipe shall be accurately measured with a steel tape and shall not exceed the tolerances set forth below, provided, however, that such tolerances do not interfere with the making of the joints.

2. For a distance of not less than eight (8) inches from the ends

the outside circumference of pipe with the following types of ends shall be not more than $\frac{1}{16}$ of an inch smaller nor more than $\frac{1}{8}$ of an inch greater than the outside circumference computed from the specified nominal inside diameter and the specified plate thickness:

a. Plain ends of slip joint pipe for field welding.
b. Plain ends with butt straps for field welding.
c. Beveled ends fitted with butt straps for field welding.
d. Both ends of inside section of inside and outside pipe sections and the smaller end of tapered section for lap riveted field joints.
e. Plain ends fitted with flanges.

3. Ends for mechanical couplings shall have tolerances within the limits required by the manufacturer of the type of coupling to be employed.

4. For a distance of not less than eight (8) inches back from the ends the inside circumference of pipe with the following type of ends shall be not more than $\frac{1}{16}$ of an inch smaller nor more than $\frac{1}{8}$ of an inch greater than the inside circumference computed from the nominal inside diameter:

a. Ends plain or beveled for field butt welding.
b. Bumped ends for riveted field joints.
c. Plain end of bell and spigot pipe for calked joints.
d. Ends for riveted field joints. (Tolerance for tapered pipe to apply at the smaller end only.)

5. The inside diameter of the bell of slip joint pipe for field welding shall be between $\frac{1}{32}$ of an inch and $\frac{1}{16}$ of an inch greater than the outside diameter of the plain end. The inside diameter of the outside section of inside and outside pipe sections and the inside diameter of the larger end of tapered sections for lap-riveted field joints shall be between $\frac{1}{16}$ of an inch and $\frac{1}{8}$ of an inch greater than the outside diameter of the inside section or smaller end of the tapered section; such outside diameter shall be determined from the nominal inside diameter and the specified plate thickness.

6. The out-of-roundness of pipe ends at fabricator's plant when measured on any diameter shall be within limits consistent with the type of field joint specified and the type of corrosion protection to be employed.

7. The ends of all pipe sections shall not vary more than $\frac{1}{8}$ of an inch at any point from a true plane at right angles to the axis of the pipe.

(b) *Wall Thickness:*

Steel plate shall be ordered to thickness with a maximum allowable variation of $\frac{1}{100}$ of an inch under the specified thickness.

(c) *Length:*

Length of straight pipe shall not vary from the specified length by more than plus or minus two (2) inches. Length of special sections shall not vary from the specified length by more than plus or minus $\frac{1}{8}$ inch.

(d) *Straightness:*

1. Finished pipe which is not spun enamel lined by the centrifugal casting process shall be commercially straight.

2. When finished pipe is to receive a spun enamel lining applied by the centrifugal casting process and the spinning equipment does not hold pipe in axial alignment, any free pipe sections with faulty alignment exceeding $\frac{1}{8}$ of an inch for each ten (10) feet in length from a line parallel to the axis of the pipe shall be straightened.

TESTS—SECT. 4-5

Sect. 4-5.1—Weld Test Specimens

(a) Transverse weld tests required on electric welded pipe are for the purpose of determining minimum tensile strength only and shall not be required on sizes under 8 inches in outside diameter.

(b) For transverse weld tests, the test specimen shall consist of a strip cut transversely from the end of the pipe with a width of $1\frac{1}{2}$ inches with the weld located about the middle of its length and machined parallel for a length of 2 inches. Specimens may be flattened hot or may be flattened cold and normalized before testing. The tensile strength across the weld shall not be less than the minimum tensile strength of the grade of steel ordered.

(c) For *fabricated* pipe the transverse weld test specimens for electric fusion-welded pipe may be taken from a welded test plate (or coupon). The welded test plate (or coupon) shall be cut from steel of the same specifications and thickness as the pipe, have edges prepared for welding, and then be attached at one end of the longitudinal joint of the pipe so that the edges to be welded in the test plate form a continuation of, and duplication of, the corresponding edges of the longitudinal joint. In this case, the weld metal shall be deposited in the plate continuously with the weld metal deposited in the longitudinal joint.

(d) Where specimens by agreement between the inspector and the manufacturer are taken from points other than the ends of the pipe, the openings resulting from removal of test specimens shall be patched in a manner approved by the inspector.

(e) All specimens shall be tested at room temperature.

Sect. 4-5.2—Flattening Tests

(a) The crop end or a ring 3 inches in width, cut from each end of each length of lap-welded or electric resistance-welded pipe, shall be flattened between parallel plates, with the weld at the point of maximum bending, until opposite walls of the pipe meet. Specimens for flattening tests shall be smooth on the ends and free from burrs. No opening in the weld shall take place before the distance between the plates is less than $\frac{2}{3}$ of the original outside diameter of the pipe. No cracks or breaks in the metal elsewhere than in the weld shall occur before the distance between the plates is less than $\frac{1}{3}$ of the original outside diameter of the pipe. Evidence of laminations or burnt material shall not develop during the entire flattening process. If any section fails to meet these requirements, another piece may be cut. If the second test fails, additional tests may be made until the requirements are met or the length rejected, except the finished pipe shall not be shorter than 80 per cent of its length after the first crop was cut. Precautions shall be taken so that crop ends or rings can be identified with respect to the lengths from which they are cut.

Sect. 4-5.3—Bend Tests

The bend test specimen 1 inch wide by 6 inches long, cut from each test length of electric fusion-welded pipe, sizes 8 inches and over in outside diameter, shall be taken across the weld and shall stand being bent cold through 180 degrees around a pin, the diameter of which is equal to $4\frac{1}{2}$ times the thickness of the plates, without developing cracks. In making the bend test, the side of the specimen representing the inside of the pipe shall be placed next to the pin. The bend test specimen shall have the protruding portions of the weld, both inside and outside the pipe, removed by machining or grinding.

Sect. 4-5.4—Number of Tests

(a) One longitudinal tension test specified in Sect. 4-2.4 shall be made on one length of pipe from each lot of 200 lengths, or fraction thereof, of each size 20 inches and under, and on one length from each lot of 100 lengths, or fraction thereof, of each size 22 inches and larger.

(b) In addition to the above, one transverse weld test on electric-welded pipe specified in Sect. 4-5.1 and on electric fusion-welded pipe one bend test specified in Sect. 4-5.3 may be made on one length from each lot of 200 lengths, or fraction thereof, of sizes 8 inches to

20 inches, inclusive, and on one length from each lot of 100 lengths or fraction thereof of each size 22 inches and larger.

(c) When taken from the skelp or plate or welded test plate (coupon), the number of tests shall be determined in the same manner as when taken from the finished pipe.

Sect. 4-5.5—Special Weld Tests

When *fabricated* steel pipe is furnished under these specifications for working pressures exceeding 200 lb. per sq.in., the additional tests of welds and welded joints as required by Section 3-5 Tests of the American Water Works Association Standard Specifications for Electric Fusion-Welded Steel Water Pipe of Sizes 30 Inches and Over (7A.3) will be made, if specifically requested by the purchaser in the call for bids.

Sect. 4-5.6—Retests

(a) If the results of the physical tests of any lot do not conform to the requirements specified, retests of two additional lengths of pipe or pieces of skelp or plate from the same lot shall be made, each of which shall conform to the requirements specified. If the results of both retests of any lot do not conform to the requirement specified, the lot shall be rejected. However, the manufacturer may, at his option, submit each length of said lot for retest.

(b) If the percentage of elongation of any longitudinal tension test specimen is less than that specified and any part of the fracture is outside the middle third of the gage length of an 8-inch specimen or more than $\frac{3}{4}$ inch from the center of the gage length of a 2-inch specimen as indicated by scribed scratches marked on the specimen before testing, the specimen may be discarded and another substituted.

(c) If any test specimen shows defective machining or develops flaws not associated with the welding, it may be discarded and another specimen substituted.

Sect. 4-5.7—Hydrostatic Test of Pipe

(a) All straight pipe shall be tested at the mill or shop to the hydrostatic pressures specified in Sect. A4-3.1 in the Appendix, which pressures shall be maintained for not less than five seconds. In this test no hammering will be required.

(b) *Sizes Not Listed:*

For diameters and wall thicknesses not listed, the test pressure shall be proportional to the pressures specified in Sect. A4-3.1 of the Appendix, which pressures shall be maintained for not less than five seconds.

(c) *Bends, Branch Connections, and Special Sections:*

Bends, branch connections and other special connections made in accordance with the requirements of Sect. 4–3.7 by certified welding operators from tested pipe shall not be subjected to a hydrostatic test pressure.

(d) *Procedure for All Welded Pipe:*

All welded seams shall be inspected for leaks and each leak shall be marked plainly. Any section showing more than one leak for each of five feet of welded seam or more than $2\frac{1}{2}$ per cent of the total length of welded seam will be rejected. Closing leaks by means of calking tool will not be permitted. The sections showing less than one leak for each five feet of welded seam and not more than $2\frac{1}{2}$ per cent of the total length of the welded seam shall have the leaks repaired by chipping the weld and rewelding by hand, after which the pipe shall be retested hydrostatically in a duplicate manner. On a retest the pipe section shall show no leaks in the welded seams and if any appear the section will be rejected. Accepted pipe sections shall be stamped after test by the inspector with some legible mark of identification.

CLEANING AND COATING PIPE SURFACES—SECT. 4-6

Sect. 4-6.1—Cleaning

If not otherwise specified by purchaser, each section of pipe shall be thoroughly cleaned both inside and outside of loose mill scale, paint, grease, oil, and other foreign substance. Method and material used in cleaning shall be approved by the inspector.

Sect. 4-6.2—Coating of Pipe

The material used and the procedure followed in priming and enameling or painting of surfaces of pipe sections shall be in accordance with the purchaser's supplementary specification based on the American Water Works Association Standard Specifications or other recognized standards.

DELIVERY—SECT. 4-7

Sect. 4-7.1—Marking

(a) Each length of uncoated *mill* pipe shall be legibly marked either by stenciling, stamping, or rolling to show by whom manufactured, the class of pipe, the outside diameter, the nominal weight per foot or wall thickness, the overall length, the test pressure and any additional marks or symbols specified by the purchaser.

(b) In the case of coatings applied to *mill* pipe at the mill, the

manufacturer's name, weight per foot or wall thickness, overall length, and class of pipe shall be legibly applied by stenciling after coating.

Sect. 4-7.2—Delivery of Pipe

When so specified, pipe sections and special sections shall be delivered in the order required and shall be loaded as required by the purchaser.

APPENDIX

Sect. A4-1.1—Definitions

The following definitions, arranged alphabetically, will apply to the American Water Works Association Standard Specifications for Steel Water Pipe of Sizes of 4 Inches up to but Not Including 30 Inches:

Bessemer Steel: Steel made by the acid bessemer process.

Butt Weld: A weld whose throat lies in a plane disposed approximately 90 degrees with respect to the surfaces of at least one of the parts joined. The size of a butt weld is expressed in terms of its net or unreinforced throat dimensions in inches. A double welded butt joint is one in which the filler metal is added to both sides. A single welded butt joint is one in which the filler metal is added to one side only.

Check Analysis: Refers to the chemical analysis taken from the skelp, or plate, or finished pipe.

Class of Pipe: The designation of pipe in accordance with method of manufacture. See Table 1 in Sect. 4–2.

Coupon (Weld Coupon): A pair of test plates of specified dimension made from metal of the same specifications and thickness as pipe wall, prepared for welding, attached to a pipe shell being welded at the end of a longitudinal joint so that the edges to be welded in the test plates are a continuation of and duplication of the corresponding edges of the longitudinal joint. The pair of plates is then made into a single weld test specimen by having the weld metal deposited in the test plates continuously with the weld metal deposited in the longitudinal joint and by the same process, procedure, and technique.

Double-Length Welded Pipe: Two single-random lengths welded together to make a double-random length.

Double-Random Lengths: The length of a pipe in its finished condition as supplied when double-length pipe of no definite length is specified, subject to limitations stated in Sect. 4–2.6.

Fabricated Pipe: Pipe made of individual curved plates formed to circles or parts of circles and joined by fusion welding to produce cylinders which in turn may be joined end to end to achieve pipe sections of various lengths.

Fillet Weld: A weld of approximately triangular cross-section whose throat lies in a plane disposed approximately 45 degrees with respect to the surfaces of the parts joined. The size of a fillet weld is expressed in terms of the width in inches of one of its adjacent fused legs, the shorter if unequal.

Flame Cutting: The process of severing metal by means of a gas flame.

Fusion Welding: The process of welding metals in the molten, or molten and vaporous state, without the application of mechanical pressure or blows.

Girth Seam: A circumferential welded seam lying in one plane used to join lengths of straight pipe or to join pieces of mitered pipe to form fabricated elbows or turns.

Grade of Material: The designation of material as to chemical analysis or physical properties.

Inspector: The word "Inspector" as used herein means the inspector or engineer of the purchaser or their respective assistants properly authorized and limited to the particular duties entrusted to them.

Ladle Analysis: The chemical analysis taken at the time the steel is being cast into ingots.

Lap-Welded Pipe: Furnace welded pipe made from skelp with scarfed or beveled edges, heated, bent to tubular form, and welded to uniform wall thickness with the edges overlapping.

Large Diameter Pipe is pipe 14 inches and over and size designations refer either to actual outside diameter or actual inside diameter and pipe is specified by outside diameter and wall thickness or inside diameter and wall thickness. Nominal weight per lineal foot should be given.

Large O. D. (outside diameter) pipe is pipe 14 inches to 30 inches, inclusive, and size designations refer to actual outside diameter. This pipe is specified by outside diameter, wall thickness, and nominal weight per lineal foot.

Manufacturer: The word "Manufacturer" as used herein means the person, firm, or corporation furnishing pipe, pipe joints, pipe fittings, and pipe coatings exclusive of any erection or installation requirements or other field work.

Mill Pipe: Pipe made from hot or cold skelp, plate, or solid rounds

by common tube mill methods wherein the process is usually more or less continuous and the pipe itself moves during the making and finishing operations.

Nominal Outside Diameter: Refers to the commercial name or given dimension for pipe in sizes up to 12 inches as distinguished from the actual or real dimension.

Nominal Size: Refers to the commercial name or given dimension for pipe in sizes up to 12 inches as distinguished from the actual or real dimension.

Nominal Wall Thickness: Refers to the theoretical wall thickness of average wall pipe which has a commercial under tolerance.

Nominal Weight Per Foot: (for Uncoated and Unlined Pipe) Refers to the theoretical weight per foot, as shown in published tables, as distinguished from the actual weight per foot of the finished pipe.

Open Hearth Steel: Steel made by the open-hearth process.

Plain End Pipe: Pipe cut off to random or exact lengths but not threaded. It is not beveled unless so specified.

Purchaser: The word "Purchaser" as used herein means either person, firm, corporation, or governmental subdivision entering into a contract or agreement for the purchase of any materials or work to be performed under these specifications.

Random Length: The length of a pipe in its finished condition as supplied when a definite length is not specified but subject to limitations stated in Sect. 4–2.6.

Resistance Welded Pipe: Pipe made by a series of operations in which the flat rolled material is cold shaped into tubular form, and the union of the seam effected by the application of heat and pressure. The welding heat is generated at the seam by resistance to the flow of an electric current.

Root: The word Root as used herein in describing fusion welding procedure means the zone at the bottom of the cross-sectional space provided to contain the deposited filler metal.

Seal Weld: A continuous weld primarily intended to secure tightness.

Seamless Pipe: Pipe without seams made from solid ingots, blooms, billets, or round bars which have been hot pierced and then brought to the desired size by either hot rolling or hot drawing or a combination of both.

Seam: The continuous line of fusion achieved by any welding process.

Specified Lengths: Sections of finished pipe whose length dimen-

sions do not vary from a fixed figure specified by the purchaser by more than the length tolerance.

Spiral Seam Fusion Welded Pipe: Pipe in which the line of the fusion seam forms a helix or part helix on the barrel of the pipe.

Standard Pipe: Pipe $\frac{1}{8}$ inch to 12 inches, inclusive, which has a definite thickness corresponding to a given diameter, and is specified by its nominal diameter. Standard pipe may be seamless or welded and is listed in three schedules by thickness: standard weight, extra strong, and double extra strong.

Straight Seam Fusion-Welded Pipe: Pipe in which the line of the fusion seam parallels the axis of the pipe.

Strength Weld: A weld designed to have a predetermined strength and primarily intended to secure a mechanically strong joint. The weld may be continuous or intermittent.

Throat: The thickness of deposited weld metal not including reinforcing, along a straight line passing through the root.

Weld: A localized consolidation of metals.

REQUIREMENTS FOR CIRCUMFERENTIAL WELDING OF STRAIGHT PIPE LENGTHS—SECT. A4-2

(*Note Sect. 4-3.2*)

Sect. A4-2.1—Method

Welding of any type generally recognized as sound commercial practice shall be permitted.

Sect. A4-3.2—Workmanship

(a) The ends of the pipe to be welded together shall be prepared in accordance with the requirements of the process used. The completed length shall be straight within limits recognized by these specifications.

(b) All welds shall be marked so as to identify the welders.

(c) The weld shall have a substantially uniform cross-section throughout the circumference of the pipe. The crowned surface shall at no point be below the outside surface of the parent metal nor shall the crown at any point rise above the outside surface of the pipe more than 50 per cent of the thickness of the pipe. Finished lengths of *mill* pipe when so stipulated shall permit the passage of a drift $\frac{1}{8}$ inch less than the nominal inside diameter of the pipe on sizes up to but not including $8\frac{5}{8}$ inches, $\frac{5}{32}$ inch on sizes $8\frac{5}{8}$ inches to 14 inches, inclusive, and $\frac{3}{16}$ inch on sizes 16 inches to 20 inches, inclusive.

Sect. A4-2.3—Tension Tests

(a) The test specimen taken across the circumferential weld but not nearer than 90 degrees to the longitudinal weld shall show a tensile strength at room temperature not less than the minimum tensile strength specified in Table 3 in Sect. 4–2 for the class of pipe in question. The openings resulting from removal of test specimens shall be patched in a manner approved by the inspector.

(b) The test specimen shall be prepared and tested in the same manner as prescribed in Sect. 4-5.1 of these specifications.

Sect. A4-2.4 – Number of Tests

One tensile test shall be made on one of each 25 welds or not less than one test per order when the total welds in the order are less than 25.

Sect. A4-2.5—Retests

If any specimen fails to develop the tensile strength specified in Table 3 in Sect. 4-2 for the class of pipe in question, the pipe length from which it was taken shall be rejected and retests on current work from two additional lengths welded by the same welder shall be made, both of which shall meet the specified tensile strength requirement. If either of these tests fails, all of the work performed by the said welder in that particular lot shall be rejected.

Sect. A4-2.6 – Repairing Defects

Minor defects in circumferential welds such as sweats or leaks may be repaired when and as specified in Sect. 4-5.7 (d).

(See Sect. 4-5.7)

Sect. A 4-3.1—Steel Pipe for Underground Water Service

*(Representative Sizes and Wall Thicknesses)**

NOMINAL SIZE	OUTSIDE DIAM.*	WALL THICKNESS (DECIMAL)	WEIGHT PER LINEAR FOOT	WORKING PRESSURE (SAFETY FACTOR OF 4.0) BASED ON 50,000 LB. TENSILE STRENGTH OF STEEL	APPROX. ULTIMATE BURSTING PRESSURE BASED ON 50,000 LB. TENSILE STRENGTH OF STEEL	TEST PRESSURE
inches	*inches*	*inches*	*pounds*	*lb. per sq. in.*	*lb. per sq. in.*	*lb. per sq. in.*
4	4.500	0.142	6.609	789	3156	950
		0.165	7.639	917	3668	1100
		0.1875	8.635	1042	4168	1300
		0.205	9.403	1139	4556	1400
		0.237	10.79	1317	5268	1600
5	5.563	0.148	8.559	665	2660	800
		0.165	9.512	742	2968	900
		0.1875	10.76	843	3372	1000
		0.250	14.18	1123	4492	1400
		0.258	14.61	1159	4636	1400
	6.000	0.156	9.751	651	2604	800
		0.165	10.28	688	2752	850
		0.172	10.70	717	2868	900
		0.1875	11.63	781	3124	950
		0.218	13.50	911	3644	1100
		0.250	15.35	1042	4168	1300
6	6.625	0.169	11.65	638	2552	750
		0.172	11.85	649	2596	800
		0.1875	12.89	708	2832	850
		0.218	14.96	823	3292	1000
		0.250	17.02	943	3772	1100
		0.280	18.97	1057	4228	1300
	8.000	0.172	14.37	538	2152	650
		0.1875	15.64	586	2344	700
		0.218	18.17	681	2724	800
		0.250	20.69	781	3124	950
		0.281	23.18	879	3516	1100
		0.3125	25.65	977	3908	1200
8	8.625	0.172	15.52	499	1996	600
		0.1875	16.89	543	2172	650
		0.218	19.63	634	2536	750
		0.250	22.36	725	2900	850
		0.277	24.69	803	3212	950
		0.322	28.55	933	3732	1100
	10.000	0.1875	19.64	469	1876	550
		0.218	22.85	547	2188	650
		0.250	26.03	625	2500	750
		0.281	29.19	702	2808	850
		0.3125	32.33	781	3124	950
10	10.750	0.1875	21.15	452	1808	500
		0.203	22.86	472	1888	550
		0.218	24.60	509	2036	600
		0.250	28.03	581	2324	700
		0.279	31.20	649	2596	800
		0.307	34.24	714	2356	850

* NOTE: Other diameters and other wall thicknesses can be furnished if required.

Sect. A 4-3.1—Steel Pipe for Underground Water Service—*Concluded*

NOMINAL SIZE	OUTSIDE DIAM.*	WALL THICKNESS (DECIMAL)	WEIGHT PER LINEAR FOOT	WORKING PRESSURE (SAFETY FACTOR OF 4.0) BASED ON 50,000 LB. TENSILE STRENGTH OF STEEL	APPROX. ULTIMATE BURSTING PRESSURE BASED ON 50.000 LB. TENSILE STRENGTH OF STEEL	TEST PRESSURE
inches	*inches*	*inches*	*pounds*	*lb. per sq. in.*	*lb. per sq. in.*	*lb. per sq. in.*
10	12.000	0.1875	23.65	391	1564	500
		0.218	27.52	456	1824	550
		0.250	31.37	521	2084	650
		0.281	35.20	586	2344	700
		0.3125	39.00	651	2604	800
12	12.750	0.1875	25.15	368	1472	450
		0.218	29.27	429	1716	500
		0.250	33.37	490	1960	600
		0.281	37.45	551	2204	650
		0.330	43.77	647	2588	800
14	14.000	0.1875	27.65	335	1340	400
		0.250	36.71	446	1784	550
		0.281	41.20	502	2008	600
		0.3125	45.68	558	2232	650
16	16.000	0.1875	31.66	293	1172	350
		0.250	42.05	391	1564	450
		0.281	47.21	439	1756	550
		0.3125	52.35	488	1952	600
18	18.000	0.1875	35.67	260	1040	300
		0.250	47.39	347	1388	400
		0.281	53.22	390	1560	450
		0.3125	59.03	434	1736	500
20	20.000	0.1875	39.67	234	936	300
		0.250	52.73	312	1248	400
		0.2812	59.23	352	1408	400
		0.3125	65.70	391	1564	450
		0.375	78.59	469	1876	550
22	22.000	0.1875	43.68	213	852	250
		0.250	58.07	284	1136	350
		0.2812	65.23	319	1276	400
		0.3125	72.38	355	1420	450
		0.375	86.60	426	1704	500
24	24.000	0.1875	47.68	195	780	250
		0.250	63.41	260	1040	300
		0.2812	71.24	292	1168	350
		0.3125	79.05	326	1304	400
		0.375	94.61	391	1564	450
		0.4375	110.09	456	1824	550
		0.500	125.49	521	2084	650
26	26.000	0.1875	51.69	180	721	200
		0.250	68.75	240	960	300
		0.2812	77.25	270	1080	350
		0.3125	85.73	300	1200	350
		0.375	102.62	360	1440	450
		0.4375	119.44	420	1680	550
		0.500	136.17	480	1920	600
28	28.000	0.1875	55.69	168	672	200
		0.250	74.09	223	892	300
		0.2812	83.26	251	1004	300
		0.3125	92.40	279	1116	350
		0.375	110.63	334	1336	400
		0.4375	128.78	390	1560	500
		0.500	146.85	446	1784	550

Tentative Standard

American Water Works Association

SPECIFICATION

for

COAL-TAR ENAMEL PROTECTIVE COATINGS FOR STEEL WATER PIPE OF SIZES 30 INCHES AND OVER

Prepared by

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These tentative specifications are part of a series of reports by A. W. W. A. Subcommittee 7A. They are as yet in tentative form and are printed for the purpose of bringing them to the attention of the membership of the Association.

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These are not official specifications of the A. W. W. A.; must not be referred to as such; and no authority is given or implied which would permit their use as official documents.—HARRY E. JORDAN, *Secretary, A. W. W. A.*

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Tentative Standard

SPECIFICATION FOR COAL-TAR ENAMEL PROTECTIVE COATINGS FOR STEEL WATER PIPE OF SIZES 30 INCHES AND OVER

GENERAL—SECT. 5-1

Sect. 5-1.1—Purpose

This specification is intended as an aid to the water works engineer in writing specifications for coal-tar enamel protective coatings for steel water pipe of large diameters. It is the result of years of experience in testing, selecting, and applying protective coatings and it represents the most modern practice in the coating industry.

This specification contains the fundamental requirements, in both material and procedure, to obtain corrosion protection for steel water pipe for ordinary service conditions.

An appendix has been added to this specification to provide additional exterior protective measures for the extraordinary or more severe soil conditions. The additional exterior protective measures included in the appendix are those used in current practice.

The purchaser, when inviting bids, shall specify his requirements for protective coating by referring to the designation of this specification and to the section and subdivision of the appendix for the type of additional protection required. In addition, the purchaser shall supply certain detailed information covering each individual contract in accordance with Sect. 5-1.3 of this specification.

Sect. 5-1.2—Scope

(a) This specification covers the material and application requirements to obtain adequate corrosion protection for steel water pipe for conditions ordinarily found in the water transmission and distribution systems with coal-tar enamel protective coatings.

(b) Corrosion protection shall be provided as follows:

1. *The inside of all pipe* shall receive a coat of coal-tar primer

followed by a hot coat of coal-tar enamel applied either by manual or mechanical means.

2. *The outside of all pipe to be placed underground* shall receive a coat of coal-tar primer followed by a hot coat of coal-tar enamel and one (1) coat of water-resistant whitewash.

3. *The outside of all pipe to be placed above ground* exposed to the weather shall receive two (2) coats of synthetic red lead primer (or one coat of synthetic red lead primer and one coat of synthetic white enamel) and one (1) coat of aluminum paint.

Sect. 5-1.3—Supplementary Details Which Shall be Supplied by the Purchaser

(a) Where a steel pipe line is to be laid under conditions ordinarily found in water transmission and distribution systems, reference to the specification shall be as follows:

The interior surface of all steel pipe shall be cleaned, primed, and lined with coal-tar enamel, Type ( )*; the exterior surface of all pipe shall be cleaned, primed, and coated with coal-tar enamel, Type ( )*; and all such material and application shall be in accordance with the American Water Works Association Tentative Specification 7A.5.

(b) If *additional exterior protection* is desired, in the opinion of the engineer, because of soil conditions, the following Example illustrates how this specification should be written:

Example: (bonded asbestos felt wrapper): The interior surface of all steel pipe shall be cleaned, primed, and lined with coal-tar enamel, Type ( )*; and the exterior shall be cleaned, primed, and coated with coal-tar enamel, Type ( )*, with a *bonded* asbestos felt wrapper. All such materials and application shall be in accordance with American Water Works Association Tentative Specification 7A.5 together with Sections A5-1.3 and A5-3.1 of the appendix of that specification.

(c) In purchasing protection for steel water pipe the purchaser shall make supplementary specific statements in his specification regarding the following:

1. *Project:* Diameter, length, and location of pipe line including maps and drawings necessary to show all details of line within the scope of the contract.

2. *Soil:* Character of soil to be encountered as determined by tests and/or inspection; depth of cover and character of backfill to be used.

* Purchaser shall specify type of coal-tar enamel.

3. *Temperatures:* Range of atmospheric temperatures to which the pipe may be subjected during, or subsequent to, installation.

4. *Exterior Protection—Underground:* Length of line to be protected for underground service.

5. *Exterior Protection—Above Ground:* Length of line to be erected above ground for atmospheric service.

6. *Contractor's Samples:* Requests for contractor's samples in accordance with Sect. 5-2.4 of this specification.

7. Additional exterior pipe protection selected from the appendix of this specification (7A.5).

8. *Materials:* When "Corrosion Protection" outlined here is to be done by force account or by separate contract, specify:

a. Quantity of coal-tar primer.

b. Quantity and type or types of coal-tar enamel.

c. Quantity of asbestos felt.

d. Quantity of paint or exposed steel surfaces.

(1) Synthetic red lead primer.

(2) Synthetic white enamel.

(3) Aluminum bronzing liquid.

(4) Aluminum pigment.

Sect. 5-1.4—Definitions

Under this specification the following definitions will apply:

(a) *Purchaser:* The word "Purchaser" shall mean either person, firm, corporation, or governmental subdivision entering into a contract or agreement for the purchase of any materials and/or any work to be performed under this specification.

(b) *Contractor:* The word "Contractor" shall mean the person, firm, or corporation executing the contract or agreement with the purchaser to furnish any material and/or to perform any work under this specification.

(c) *Engineer:* The word "Engineer" shall mean the engineer or inspector employed by the purchaser and acting as his representative; their respective assistants properly authorized and limited to the particular duties assigned to them; or to the purchaser, himself, acting as his own engineer.

(d) *Blasting:* The word "Blasting" shall mean blasting with standard sand blasting sand or steel grit to clean and thoroughly remove all rust and mill scale from the steel.

(e) *Centrifugal Casting:* The words "Centrifugal Casting" shall mean the process of applying coal-tar enamel to the inside surface

of pipe whereby molten coal-tar enamel introduced into the pipe is spread on the surface of the pipe and held thereon by the centrifugal force developed by rotating the pipe about its longitudinal axis until the coal-tar enamel has cooled and solidified and become bonded to the pipe.

Sect. 5-1.5—Inspection and Testing

(a) The entire procedure of applying the protective coating material as herein specified will be rigidly inspected from the time the bare pipe is received until the coated pipe is laid in the ground and backfilled and/or installation of surface pipe is completed. Such inspection shall not relieve the contractor of his responsibility to furnish material and perform work in accordance with this specification.

(b) All coating work to be acceptable must be applied in the presence of the Inspector, and all such work done in his absence will be subject to rejection unless the continuance of the work during his absence is specifically allowed by the inspector. If at any time it is found that the procedure of applying the protective coating material is not in accordance with this specification, all such coating work may be rejected.

(c) Prior to approval of contractor's material, samples of material submitted by the contractor will be tested by the purchaser and if any sample is found not to conform to this specification, material represented by such sample will be rejected. If samples of contractor's approved materials are found not to conform to the specification, all such material will be rejected.

(d) Samples submitted to the purchaser will be tested in the purchaser's laboratory or in a responsible commercial laboratory designated by the purchaser.

(e) The expense of testing of all samples of material originally offered by the contractor will be borne by the purchaser; the expense of all subsequent tests, due to failure of samples of material originally offered to comply with this specification, will be charged to the contractor.

Sect. 5-1.6—Access for Inspector

The inspector shall have free access to those parts of all plants that are concerned with the furnishing of materials or the performance of work under this specification.

Sect. 5-1.7—Facilities for Inspector

The contractor shall furnish the inspector reasonable facilities and space without charge for the inspection, testing, and obtaining of such information as he desires respecting the character of material used and the progress and manner of the work.

Sect. 5-1.8—Material and Workmanship

All material furnished by the contractor shall be of the specified quality. All work shall be done in a thorough workmanlike manner. The entire operation of priming the pipe and heating and applying the coal-tar enamel coatings shall be performed under the supervision of experienced men skilled in the application of coal-tar enamel.

Sect. 5-1.9—Equipment

The contractor's equipment for all blasting, priming, enameling, and painting shall be designed and manufactured and shall be in such condition as to permit applicators to follow the procedure and obtain results prescribed in this specification.

Sect. 5-1.10—Packaging

All coal-tar enamel purchased or used under this specification shall be packaged in suitable and approved containers.

MATERIAL SPECIFICATIONS—SECT. 5-2

Sect. 5-2.1—Coal-Tar Primer

All coal-tar primer to be used under this specification shall comply with the following:

(a) The primer shall consist of unadulterated coal-tar pitch and refined coal-tar oils only, suitably blended to produce a liquid coating which may be applied cold by brushing or spraying and which will produce suitable bond between the metal and subsequent coating of coal-tar enamel. Primer shall contain no benzol or other toxic or highly volatile solvents and no added pigments or inert fillers, or other substances, and shall show no tendency to settle out in the container.

(b) The primer shall have good spraying, brushing, leveling properties, and a minimum tendency to produce bubbles during application. The primer shall dry hard to the touch when applied as recommended.

Sect. 5-2.2—Type A Coal-Tar Enamel

Type A Enamel, because of certain steel pipe handling and/or construction conditions, may be used as *interior lining* or *exterior protection*, as specified and/or agreed to by the purchaser and contractor, at any period during the performance of the work.

This enamel shall be composed of a specially processed coal-tar pitch combined with an inert mineral filler. No asphalt of either petroleum or natural base shall be acceptable as part of the ingredients. The enamel shall have the following characteristics:

	Minimum	Maximum
Softening point—A.S.T.M. D 36 - 26	220° F.	———
Filler (ash)—A.S.T.M. D 271 - 37	25 per cent	35 per cent
Fineness filler, through 200 mesh—A.S.T.M. D 7 - 27	90 per cent	———
Specific Gravity at 25° C.—A.S.T.M. D 71 - 27	1.40	1.60
Penetration—A.S.T.M. D 5 - 25		
At 77° F.—100 gram wt.—5 sec	7	16
At 115° F.—50 gram wt.—5 sec	15	35
High temperature test—at 160° F.—(sag) Test Method Sect. 5-2.5 (d)	———	$\frac{2}{32}$ in.
Low temperature test—at minus 20° F.—(cracking)—Test Method Sect. 5-2.5 (e)	———	None
*Deflection test (Initial Heating)—Test Method Sect. 5-2.5 (f)		
Initial Crack	0.8 in.	———
Disbonded Area		3.0 sq.in.
*Deflection test (After Heating)—Test Method Sect. 5-2.5 (g)		
Initial Crack	0.6 in.	———
Disbonded Area	———	5.0 sq.in.
*Impact test—at 77° F.—650 gr. ball—8-foot drop—Test Method Sect. 5-2.5 (i)		
Direct impact—Disbonded area	———	10.0 sq.in.
Indirect impact—Disbonded area	———	2.0 sq.in.
Peel test—Test Method Sect. 5-2.5 (h)	None at any temperature up to and including 160° F.	

* *Note:* Choice of Bond Testing Methods A or B by deflection (before heating), by deflection (after heating), or by impact, shall depend upon laboratory equipment available.

Sect. 5-2.3—Type B Coal-Tar Enamel

Type B Enamel, because of certain steel pipe handling and/or construction conditions, may be used as *interior lining* or *exterior*

protection, as specified and/or agreed to by the purchaser and contractor, at any period during the performance of the work.

This enamel shall be composed of a specially processed coal-tar pitch combined with an inert mineral filler. No asphalt of either petroleum or natural base shall be acceptable as part of the ingredients. The enamel shall have the following characteristics:

	Minimum	Maximum
Softening point—A.S.T.M. D 36 - 26	220° F.	———
Filler (ash)—A.S.T.M. D 271 - 37	25 per cent	35 per cent
Fineness filler, through 200 mesh—A.S.T.M. D 7 - 27	90 per cent	———
Specific Gravity at 25° C.—A.S.T.M. D 71 - 27	1.40	1.60
Penetration—A.S.T.M. D 5 - 25		
At 77° F.—100 gram wt.—5 sec	3	8
At 115° F.—50 gram wt.—5 sec	10	28
High temperature test—at 160° F.—(sag) Test Method Sect. 5-2.5 (d)	———	$\frac{2}{32}$ in.
Low temperature test—at minus 20° F.—(cracking)—Test Method Sect. 5-2.5 (e)	———	None
*Deflection test (Initial Heating)—Test Method Sect. 5-2.5 (f)		
Initial Crack	0.5 in.	———
Disbonded Area	———	6.0 sq.in.
*Deflection test (After Heating)—Test Method Sect. 5-2.5 (g)		
Initial Crack	0.3 in.	———
Disbonded Area	———	10.0 sq.in.
*Impact test—at 77° F.—650 gr. ball—8-foot drop—Test Method Sect. 5-2.5 (i)		
Direct impact—Disbonded area	———	20.0 sq.in.
Indirect impact—Disbonded area	———	8.0 sq.in.
Peel test—Test Method Sect. 5-2.5 (h)	None at any temperature up to and including 160° F.	

* *Note:* Choice of Bond Testing Methods A or B by deflection (before heating), by deflection (after heating), or by impact, shall depend upon laboratory equipment available.

Sect. 5-2.4—Contractor's Samples and Detailed Information

(a) When specified by the purchaser, the contractor shall submit to the purchaser for testing, prior to any work under this specification, a 50-pound sample of the coal-tar enamel and a 1-quart sample of the coal-tar primer he proposes to furnish. Samples shall be taken from a production run of the manufacturer's plant.

(b) Contractor shall submit detailed specifications of the coal-tar

enamel and coal-tar primer to be supplied for the project, with instructions for the handling and application of the material; specifications and such instructions shall include:

1. Certified copy of results of tests made by the manufacturer covering physical and performance characteristics of the enamel to be furnished.
2. Method of application of primer and coverage in square feet per gallon.
3. Minimum and maximum drying time of the primer before application of enamel.
4. Application temperature of enamel.
5. Maximum allowable temperature to which enamel may be heated.
6. Maximum time enamel may be held in heating kettles at application temperature.

(c) After the contractor has obtained approval from the purchaser for the coal-tar enamel and coal-tar primer he proposes to furnish, he will be required to furnish the purchaser a certified copy of results of tests made by the manufacturer covering physical and performance characteristics of each batch of enamel and primer to be supplied under this specification. When requested by the purchaser, the contractor shall furnish or allow the purchaser to collect samples of the material representative of each batch of enamel and/or primer. Certified test reports and samples furnished by the contractor shall be properly identified to each batch of enamel and/or primer.

Sect. 5-2.5—Test Procedure for Primer and Enamels

Tests to determine physical characteristics of enamel and primer furnished by the contractor or collected by the purchaser shall be in accordance with the American Society for Testing Materials Standard Designations as indicated in Sections 5-2.2 and 5-2.3 of this specification. The preparation of test specimens and the testing for performance characteristics by methods other than A.S.T.M. producers shall be tested in accordance with the following procedure:

(a) *Preparation of Test Plates:* All performance tests shall be made on new mild steel plates that are flat and true to dimension. One side of each plate shall be freshly blasted to a uniform steel gray surface, completely removing stains, rust, mill, scale, et cetera. For blasting, a sharp dry sand having a minimum of 50 per cent retained on a 60-mesh screen or a No. 50 steel grit shall be used with an air pressure of not less than 50 pounds per square inch.

(b) *Priming of Test Plates:* All test plates shall be primed in accordance with the manufacturer's instructions for the material being tested; that is, number and method of applications, coverage per square foot, drying time, et cetera.

(c) *Preparation of Enamel for Testing:* Thirty (30) pounds of enamel broken into pieces approximately four (4) inches maximum dimension shall be rapidly melted over a large gas burner in a metal container of uniform cross section not less than eight (8) inches nor more than twelve (12) inches in diameter. Immediately upon reaching the specified application temperature the enamel shall be applied to the test plates required for high temperature and low temperature performance, Method A or Method B; deflection test (initial heating), Method A; peel test; and impact test, Method B. The remaining enamel in the container, which shall be not less than twenty (20) pounds, shall be maintained at the recommended application temperature for a two-hour period. The enamel shall be stirred with a metal bar at intervals of fifteen (15) minutes during the heating period. A one-fourth ($\frac{1}{4}$) inch steel plate shall be interposed between the container and gas flame to avoid superheating. After the two-hour heating period this enamel shall be applied to the test plates required for "*Deflection Test (after 2-hour heating), Method A.*" The application temperatures and method of application shall be as recommended by the coating manufacturer. The enamel shall be applied to a thickness of $\frac{2}{32}$ of an inch to $\frac{3}{32}$ of an inch for all test plates.

(d) *Testing Procedure:* Depending on the laboratory equipment available, either Method A or Method B shall be used for the following tests:

1. *High Temperature Test:*

a. *Method A:* Two 12 x 4 x $\frac{3}{16}$ in. plates prepared as above, on which shall be scribed three (3) lines at 3-inch intervals across the enamel surface, shall be tested as directed under "Procedure."

b. *Method B:* Two 12 x 12 x $\frac{7}{64}$ in. plates prepared as above with a one-half ($\frac{1}{2}$) inch uncoated border left around the four (4) edges of the plates, on which shall be scribed lines one (1) inch apart across the face of the enamel and continued on the uncoated surface of the plate to the edges, shall be tested as directed under "Procedure."

c. *Procedure:* The plates as prepared for Method A or Method B shall be stored in a vertical position in a chamber, the temperature of which shall be controlled for twenty-four

(24) hours at 160 degrees Fahrenheit for Type A or Type B Enamel. At the end of this period the plates shall be removed and cooled to room temperature and the average sag of the lines on the two (2) plates shall be recorded as sag of the enamel.

2. *Low Temperature Test:* After the two (2) plates, prepared as in Method A or Method B, have been used in the above test, they shall be placed in a chamber, the temperature of which shall be controlled for a 6-hour period at minus 20 degrees Fahrenheit for Type A or Type B Enamel. At the end of this period the plates shall be removed and allowed to reach room temperature, then examined for evidence of cracking and/or disbonding of the enamel.

3. *Deflection Test (Initial Heating):* Four (4) plates, 10 x 4 x $\frac{1}{16}$ in., prepared as above for testing under Method A for Type A and Type B Enamel, shall be stored in a chamber, the temperature of which shall be controlled at 40 degrees Fahrenheit. After a 6-hour period the plates shall be tested for deflection on equipment in this chamber by supporting the plates on one-eighth ($\frac{1}{8}$) inch radius knife edges which are spaced on $9\frac{1}{2}$ inch centers. The deflecting load shall be centrally applied across the plate by a one-half ($\frac{1}{2}$) inch radius mandrel at the rate of one (1) inch per minute (to produce tension in the enamel) until cracking occurs, as indicated by an electrical holiday detector. The deflection producing the initial cracking shall be recorded and the deflection shall then be continued to a maximum distance of $1\frac{1}{2}$ inches. The specimen shall then be removed from the machine for examination. All disbonded enamel shall be removed from the plate and the area of metal exposed on the four (4) plates shall be measured. The average results of initial cracking and disbonded area shall be recorded.

4. *Deflection Test (after 2-hour heating):* Four (4) plates, 10 x 4 x $\frac{1}{16}$ in., prepared as above for testing under Method A for Type A and Type B Enamel, shall be used in this test. The procedure shall be the same as described in Sect. 5-2.5 (d) 3 above and the average results of initial cracking and disbonded area shall be recorded.

5. *Peel Test:* One (1) plate, 12 x 12 x $\frac{1}{2}$ in., shall be prepared as above for testing for Type A and Type B Enamel and after the application of enamel, this plate shall be allowed to cool to room temperature. The condition of bond shall be tested over a temperature range of 80 degrees to 160 degrees Fahrenheit at

successive intervals of 20 degrees Fahrenheit, that is, 80 degrees, 100 degrees, 120 degrees, 140 degrees, 160 degrees Fahrenheit. The test shall be made at the temperatures indicated by immersing the plates for a period of approximately one-half ($\frac{1}{2}$) hour in a water bath maintained at the selected temperature. At the end of each of these periods the plate shall be removed from the bath and immediately tested for peel. This shall be done by attempting to peel, strip, or lift the enamel from the plate by means of a knife blade inserted between the enamel and an edge of the plate. Adhesion of the enamel at each of the indicated test temperatures, to the extent of preventing peeling, stripping, or lifting, shall be recorded as no peeling. The use of the water bath for the 80 degrees Fahrenheit test may be omitted when the room temperature closely approximates 80 degrees Fahrenheit.

6. *Impact Test:* The 12 x 12 x $\frac{7}{64}$ in. plates, prepared as above and used under test procedures Sect. 5-2.5 (d) 1 and 5-2.5 (d) 2 under Method B for Type A or Type B Enamel, shall be allowed to reach room temperature and then shall be immersed in a water bath held at a uniform temperature of 77 degrees Fahrenheit for a period of at least one (1) hour before testing. Each plate shall be removed from the water bath, dried with a soft clean cloth, and immediately subjected to the impact test.

a. *Direct Impact:* Each plate shall be supported on the true plane surface of a block of wood. A 650-gram steel ball with a well polished spherical surface shall be dropped from a height eight (8) feet above the surface of the plate when testing Type A or Type B Enamel. The ball shall be dropped so as to strike the enamel at a point at least four (4) inches from any edge of the plate. After one (1) such impact the enamel shall be examined for evidence of shattering and loosening from the plate.

b. *Indirect Impact:* After being subjected to direct impact, plates shall then be placed with the coated face down on a wooden block through which a $3\frac{1}{2}$ inch diameter hole has been cut. The same ball shall then be dropped from a height of eight (8) feet above the surface of the plate, when testing Type A or Type B Enamel, so as to strike the steel plate at a point over the center of the hole in the wooden support block. The point of impact shall be at least four (4) inches from any edge of the plate and shall be at least three (3) inches from the point of direct impact. After one

(1) such impact the enamel shall be examined for evidence of shattering and loosening of the coating.

Coating that has been knocked off the plate by the impact of the steel ball shall be considered as shattered coating. Loose coating is coating that has not shattered but can be easily and readily removed from the plate by fingers or, with very little force, by the use of a knife blade or similar instrument. After removal, the area of loosened coating shall be determined.

Sect. 5-2.6—Whitewash Formula

All whitewash to be used shall be mixed in accordance with the following formula:

(a) *Ingredients:*

50 gallons water
1 gallon boiled linseed oil
150 pounds processed quick lime
10 pounds salt

(b) *Mixture:* Lime and oil shall be slowly added simultaneously to the water and mixed thoroughly. The mixture shall be allowed to stand for not less than three (3) days before it is used.

Sect. 5-2.7—Synthetic Red Lead Primer

The paint to be used for the first and second exterior coats on steel structures erected above ground shall comply with the following:

(a) The red lead primer shall be a ready mixed paint composed of red lead pigment and synthetic resin vehicle well ground together to produce a liquid coating which may be applied by brushing or spraying and which will dry rapidly and provide a suitable bond between the metal and subsequent coating of paint. The primer shall contain no benzol or other toxic solvent and shall show no tendency to jell or liver in the container.

(b) The primer shall possess the following physical characteristics:

1. Viscosity at 77° F.—30–50 seconds Gardner Mobilometer (Solid Plunger) 150 gram total weight, 10 cs drop.
2. Weight per gallon—20–22 pounds A.S.T.M. D 287–33.
3. Dry red lead (97 per cent Pb_3O_4) Min. 70 per cent by weight.
4. Varnish vehicle (Synthetic Resin Type) Max. 30 per cent. by weight.

(c) The vehicle shall be a synthetic resin varnish consisting of either an alkyd or phenol-formaldehyde resin with the necessary

vegetable oils and volatile thinners to produce elasticity, waterproofness, adherence, and durability in the finished paint film.

(d) The red lead primer shall have satisfactory working properties defined as:

The red lead primer shall be readily broken up with a paddle to a smooth uniform paint suitable for brushing or spraying with the addition of not more than ten (10) per cent, by volume, of a suitable non-toxic thinner. The red lead primer applied by either method shall have good self-leveling properties, both of the vehicle and the pigment, and when brushed or sprayed on a vertical surface at a coverage rate of 500 square feet per gallon, shall dry hard and elastic without running, streaking, or sagging. The drying properties shall be such that the primer film will dry dust free and free to touch in one (1) hour, and dry to a smooth hard film in six (6) hours. The primer film produced shall have a flat or semi-gloss finish after twenty-hour (24) hours drying.

(e) Red lead primer shall be packaged in iron pails of five (5) gallon maximum capacity.

Sect. 5-2.8—Synthetic White Enamel

When pipe to be erected above ground is installed during hot weather, the second coat of primer shall be synthetic white enamel in place of synthetic red lead primer. Synthetic white enamel shall comply with the following:

(a) The synthetic white enamel shall be a ready mixed paint composed of titanium oxide pigment and alkyd resin vehicle well ground together to produce a liquid coating which may be applied readily by brushing or spraying, which dries rapidly, and which provides a suitable bond with the synthetic red lead primer over which it is applied. The white enamel shall contain no benzol or other toxic solvent and shall have a minimum tendency to settle out the pigment in the container. The composition of the paint shall be as follows:

Pigment (100 per cent Titanium Oxide)	25 per cent
Varnish Vehicle (Alkyd Resin Type)	75 per cent

(b) The vehicle shall be of the alkyd resin type and shall contain forty (40) per cent non-volatile solids. The volatile constituents shall be seventy (70) per cent coal-tar hydrocarbon solvents and thirty (30) per cent high flash naphtha.

(c) The synthetic white enamel shall have satisfactory working properties defined as follows:

The white enamel shall be readily broken up with a paddle to a smooth uniform paint suitable for brushing or spraying with addition of not more than ten (10) per cent of a suitable non-toxic thinner The white enamel as applied by either method shall have good self-leveling properties and when brushed or sprayed on a vertical surface at a coverage rate of 500 square feet per gallon shall dry hard and elastic without running, streaking, or sagging. The drying properties shall be such that the paint film will dry dust free and free to touch in one (1) hour and dry to a smooth hard film in twenty-four (24) hours. The film when dried shall show a strong tendency to chalk on the surface when exposed to the weather.

Sect. 5-2.9—Aluminum Bronzing Liquid

(a) The vehicle for aluminum paint shall be composed of treated oils, resins, metal driers, and volatile thinners. Treated oils shall be manufactured from the highest grade of spar varnish and linseed and chinawood oils. Resins employed shall be the so-called synthetic type, representing three (3) distinct types, which shall perform the double duty of setting and drying the oil film through in the shortest possible time and increase the resistance of the film to acids and alkalis and weathering. Solvents shall be a mixture of turpentine, coal-tar, and petroleum thinners designed to evaporate just rapidly enough to promote the proper speed of drying without impairing the working qualities of the vehicle and shall be of proper blend required to produce the maximum floating of the aluminum bronze.

(b) The vehicle shall conform to the following tests:

1. *Appearance:* Clear and transparent.

2. *Color:* Not darker than tube No. 14 of Gardner-Color Standards for Varnishes and Lacquers.

3. *Flash Point:* Not below 86 degrees Fahrenheit.

4. *Non-Volatile Matter:* Not less than fifty (50) per cent, by weight.

5. *Viscosity at 77 degrees Fahrenheit:* 0.5 to 1.0 poises. (Tubes A to D Gardner-Holt Standards.)

Test procedure indicated in A.S.T.M. Serial Designation: D 154 – 28.

(c) The vehicle shall have the following physical properties:

1. Set to touch in not more than three (3) hours at 70 degrees Fahrenheit, sixty-five (65) per cent relative humidity.

2. Dry hard in not more than twenty-four (24) hours at 70 degrees Fahrenheit.

3. When mixed with aluminum bronzing pigment in the ratio

of two (2) pounds of pigment to one (1) gallon of vehicle, the resulting paint shall have good flowing, covering, and leveling properties with the ability to float aluminum bronze flakes to the surface uniformly without allowing the bronze to break or separate before setting. The paint shall be readily appliable by air spray gun methods and when applied to a vertical steel surface in the coverage rate of 300 to 400 square feet per gallon the paint film so applied shall dry without running, streaking, sagging, or wrinkling. The paint when dry shall have high light reflective properties.

Sect. 5-2.10—Aluminum Bronzing Pigment

The aluminum bronzing pigment shall conform to the following Federal Specifications for the respective grades designated:

(a) Standard Varnish Grade Powder—Federal Specification No. TT-A-476, Type A.

(b) Standard Paste—Federal Specification No. TT-A-466.

SHOP APPLICATION OF COAL-TAR PRIMERS AND ENAMELS—SECT. 5-3

Sect. 5-3.1—General

The contractor shall furnish all labor, equipment, and material required, shall prepare all surfaces to be coated, and shall apply the coal-tar primer and coal-tar enamel to all interior and exterior surfaces to be coated.

Sect. 5-3.2—Preparation of Surfaces

(a) *Mechanical Cleaning:* Before blasting, all oil and grease on the surfaces of the metal shall be removed thoroughly by flushing and wiping using "Xylol," or other suitable coal-tar base solvents, and clean rags. The use of dirty or oily rags or solvent will not be permitted. All other foreign matter shall be removed by buffing or by scraping and wire-brushing. After cleaning, the pipe shall be protected from and maintained free of all oil, grease, and dirt that might fall upon the pipe from whatever source until the pipe has received its final enamel coat. All metal surfaces shall be thoroughly blasted to bright metal satisfactory to the engineer. At the option of the contractor, steel grit blasting may be used as an alternate to sand blasting to thoroughly remove rust and scale. Blasted surfaces that rust before a priming coat has been applied shall be cleaned of all rust by buffing or wire-brushing or, at the discretion

of the engineer, shall be re-blasted. Adequate air separators shall be used to remove effectively all oil and free moisture from the air supply to the blaster. Any pipe showing pits after beginning of blasting shall be set aside immediately pending examination by the Engineer for approval, reconditioning, or rejection.

(b) *Pipe Mill Practice:* In rapid production pipe mills the interior of the pipe shall be cleaned by blasting or by pickling-and-washing until neutral to litmus, or by rattling. The exterior of the pipe shall be cleaned by blasting, pickling-and-washing until neutral to litmus, or by wire-brushing and washing with coal-tar solvent; or a combination of these methods may be used that will result in the surface being free and clean of all loose mill scale, rust, dirt, oil, grease, moisture, or other objectionable matter. All pipe shall be primed with coal-tar primer immediately after the cleaning operation.

Sect. 5-3.3—Coal-Tar Priming

The coal-tar primer shall be as specified in the paragraphs under Sect. 5-2.1 of this specification and the application shall be as follows:

(a) All blasted steel surfaces shall be cleaned of dust and grit by brushing and air blowing and shall be *primed immediately following blasting and cleaning.* The surfaces shall be dry at the time the coal-tar primer is applied and no primer shall be applied during rain or fog unless protected from the weather by suitable housing.

(b) At the option of the contractor, the application of the primer shall be by hand brushing, air gun spraying, or spraying-and-brushing, and shall be in accordance with instructions for application as supplied by the manufacturer of the primer. The apparatus to be used for application of the primer shall be approved by the engineer. Spray-gun apparatus to be used shall include a mechanically agitated pressure-pot and an air separator that will remove all oil and free moisture from the air supply.

(c) The use of coal-tar primer that becomes fouled with foreign substances or has thickened through evaporation of the solvent oils will not be permitted.

(d) After application, the coal-tar priming coat shall be uniform, free from floods, runs, sags, drips, holidays, or bare spots. Any bare spots or holidays shall be recoated with an additional application of primer. All runs, sags, floods, or dips shall be removed by scraping and cleaning and the cleaned area retouched or, at the discretion of the engineer, all such defects shall be remedied by re-blasting and repriming. Suitable measures shall be taken to protect applied

primer from contact with rain, fog, mist, spray, dust, or other foreign matter until completely hardened.

(e) In cold weather when the temperature of the steel is below 45 degrees Fahrenheit or at any time when moisture collects on the steel, the steel shall be warmed to a temperature of approximately 100 degrees Fahrenheit for sufficient time to dry the pipe prior to priming. To facilitate spraying and spreading, the primer may be heated and maintained during the application at a temperature of not more than 100 degrees Fahrenheit.

(f) The minimum and maximum allowable drying time of the coal-tar primer between application of primer and application of coal-tar enamel shall be in accordance with instructions issued by the manufacturer of the primer unless otherwise directed by the engineer. If the enamel is not applied within the maximum time after priming, as required by the manufacturer or as directed by the engineer, the pipe shall be reprimed with an additional light coat of primer or, at the discretion of the engineer, the entire prime coat shall be removed by re-blasting and the pipe reprimed.

Sect. 5-3.4—Preheating of Primed Pipe

(a) At all times during cold weather when pipe temperature is below 45 degrees Fahrenheit or during rainy or foggy weather when moisture tends to collect on cold pipe, enameling shall be preceded by warming the pipe.

(b) Warming shall be done in a preheating oven, or in rooms maintained at recommended temperature by indirect heat while pipe is on spinning rolls, or by any other method which will heat pipe uniformly to recommended temperature without injury to primer. Steel temperature of pipe shall not exceed 125 degrees Fahrenheit.

(c) After heating and while pipe is at its highest temperature, inside lining enamel shall be applied. Coating of the outside of the pipe with coal-tar enamel shall proceed immediately after the spinning operation is completed while the pipe is still warm from preheating and centrifugal casting.

(d) The same procedure shall apply for pipe primed on the outside with synthetic red lead primer except that the second coat of paint need not be applied while the pipe is hot.

Sect. 5-3.5—Coal-Tar Enamel Application

The type of coal-tar enamel to be used for the interior lining and the exterior coating shall be in accordance with Sections 5-2.2 and 5-2.3 of this specification. The application shall be as follows:

(a) *Heating of Coal-Tar Enamel:* The enamel shall be heated in approved heating kettles equipped with accurate and easily read thermometers. In addition, the purchaser reserves the right to provide recording thermometers; such thermometers shall be installed on the heating kettles as directed by the engineer and at the expense of the contractor. Such thermometers will be checked and adjusted by the engineer whenever necessary. The charts therefrom shall constitute a basis for acceptance or rejection of any enamel because of improper heating and/or handling.

(b) The operating and/or supply kettles shall be provided in sufficient numbers so that the enamel may be heated and coordinated with the application procedure. No enamel shall be held in the operation kettles at application temperatures for a longer period than recommended by the manufacturer and as stated in his instructions. The enamel heated in supply kettles shall not exceed the temperatures and melting periods as recommended by the coating manufacturer. Operating kettles shall not be used as a continuous source of supply by adding unmelted enamel during the time they are in use but shall be completely emptied of one charge and cleaned, if necessary, before the next charge of unmelted enamel is added; except in the practice of field patching, the engineer may permit continuous use of a heating kettle not exceeding fifty (50) gallons capacity. Kettles shall be covered with hinged lids which may be securely fastened down and shall be tightly closed during the heating and application of enamel except for necessary loading and stirring.

(c) The enamel shall be maintained moisture and dirt free at all times prior to and at the time of heating and application.

(d) In loading the kettles the enamel shall be broken into pieces not exceeding ten (10) pounds.

(e) In heating the enamel the charge shall be melted and brought up to application temperature as rapidly as possible without injury to the enamel. The temperature at which the enamel will be applied shall be in accordance with the recommendation furnished by the manufacturer. The hot enamel shall be thoroughly stirred at intervals not exceeding fifteen (15) minutes regardless of whether the enamel is being used from kettles or is being held ready for use. Iron paddles shall be used for stirring; wooden paddles will not be permitted.

(f) The maximum allowable temperature to which enamel may be heated and the maximum allowable time that the enamel may be held in the kettles at application temperature shall be in accordance with the instructions supplied by the manufacturer.

(g) Enamel that has been heated in excess of the maximum allowable temperature, or that has been held at application temperature for a period in excess of that specified, shall be condemned and rejected. Fluxing the enamel will not be permitted.

(h) Excess enamel remaining in a kettle at the end of any heat shall not be included in a fresh batch in an amount greater than ten (10) per cent of the batch. Kettles shall be emptied and cleaned at least once in any 24-hour period. The material removed in cleaning the kettles shall be dumped and wasted.

Sect. 5-3.6—Application of Coal-Tar Enamel to Interior Surfaces

(a) The primed steel surface to be enameled shall be dry and clean at the time the enamel is applied. No enamel shall be applied during cold weather, rain, or fog unless the pipe is preheated and/or protected by suitable housing.

(b) The application of the enamel to the inside surface of all pipe other than specials shall be by centrifugal casting by either the Trough Method (Sect. 5-3.7 of this specification) or by the Retracted Weir or Feed Line Method (Sect. 5-3.8 of this specification).

(c) During application of enamel, the pipe shall be revolved at the speed best suited to produce a smooth glossy lining of uniform thickness. Finished coal-tar enamel lining shall be free from wrinkles, sags, blisters, or blow holes. Thickness of lining shall be $\frac{3}{32}$ of an inch and the allowable variations in thickness shall not exceed plus or minus $\frac{1}{32}$ of an inch. All pieces of lined pipe in which excessive rough areas appear or other irregularities exist that are unsatisfactory to the engineer shall be stripped of the entire lining and relined as herein required for original lining.

(d) All kettles shall be equipped with adequate screens to prevent particles of foreign matter or other deleterious materials from appearing in the finished coating.

(e) Water used for chilling the enamel lining following centrifugal casting shall not be applied until the enamel has hardened sufficiently to prevent water marks.

Sect. 5-3.7—Centrifugal Casting of Coal-Tar Enamel by the Trough Method

(a) Pipe shall be rotated on rubber tired or steel wheels with suitable guards to prevent pipe from leaving the rolls during spinning operations.

(b) Molten enamel shall be introduced into pipe by a pouring trough extending the full length of pipe in either one (1) or two (2)

sections. Pouring trough shall be level and shall have a straight and even pouring lip. Trough may be heated either by electrical heating elements or by a gas flame to a temperature best adapted to the equipment available.

(c) Transfer of molten enamel from kettles to pouring troughs shall be conducted in such a manner as to prevent excessive loss of heat. Hot enamel shall be held in the pouring troughs between filling and pouring for not more than one (1) minute. Enamel shall not be poured from troughs into the pipe until the pipe has reached its maximum speed of rotation.

(d) Enamel shall be poured by inverting the trough with a uniform rotation and at such speed as to distribute the enamel evenly throughout the pipe.

(e) Immediately after the pouring operations the trough shall be righted and removed from the pipe and cleaned, when necessary, of all excess enamel remaining in the trough. Such enamel may be re-used if it is clean and free of dirt by adding to fresh batches in quantities not exceeding ten (10) per cent of unmelted enamel.

Sect. 5-3.8—Centrifugal Casting of Coal-Tar Enamel by the Retracting Weir or Feed Line Method

(a) Pipe shall be rotated on rubber tired wheels with suitable guards or hold-down wheels to prevent the pipe from leaving the rolls during spinning operations.

(b) The hot enamel shall be introduced into the rotating pipe by means of a retractable feed line or over a traveling weir whose pouring lip is parallel to the longitudinal axis of the pipe. In either case the discharge element of the supply mechanism shall travel the entire length of the pipe. The speed of travel shall be properly coordinated with the speed of rotation to insure complete multiple application of the molten enamel.

(c) Molten enamel shall be supplied to the weir or feed line from a reservoir through supply pipes and maintained at application temperature by means of insulation and by the use of suitable methods of heating both reservoir and supply line. Supply of enamel shall be by means of a power driven circulation pump.

Sect. 5-3.9—Application of Coal-Tar Enamel to Exterior Surfaces

(a) The primed steel surface to be enameled shall be dry and clean at the time the enamel is applied. Any damage occurring to the primer coat shall be repaired by retouching before application of the enamel.

(b) External enamel shall be applied by pouring on the revolving pipe and spreading to the specified thickness. Enamel shall be applied so that each spiral resulting from the spreading operations shall overlap the preceding spiral, producing a continuous coat free from defects. The thickness of coating shall be $\frac{3}{32}$ of an inch and the allowable variation in thickness shall not exceed plus or minus $\frac{1}{32}$ of an inch.

(c) The enameled pipe shall not be rolled nor supported on its enameled surface until thoroughly cooled and hardened.

(d) For application to specials and other shapes see Section 5-3.12 of this specification.

Sect. 5-3.10—Application of Coal-Tar Enamel at End of Pipe Sections

(a) When pipe sections are to be joined together by field welding or riveting, the protective materials shall be left off the inside and outside surfaces at the ends a distance sufficient to permit the making of field joints without injury to the lining and coating.

(b) When pipe sections are to be joined together with mechanical couplings, the protective materials shall be left off the exterior of the pipe a distance back from the ends of one (1) inch more than one-half ($\frac{1}{2}$) the overall length of the assembled coupling. The interior enamel lining shall extend to the pipe end.

(c) For joints other than specified herein the length of pipe to be left bare at ends shall be in accordance with instructions supplied by the engineer. The exterior enamel edges at ends of pipe shall be scraped and feathered from zero to minimum thickness in a distance of approximately one (1) inch.

Sect. 5-3.11—Application of Coal-Tar Enamel to Welds of Straight Pipe Sections

When the minimum lining thickness cannot be secured over welds, all longitudinal and girth welds, before application of the interior lining, shall be given a coat of hot enamel one-sixteenth ($\frac{1}{16}$) of an inch thick applied with daubers or by pouring to a width of not less than $1\frac{1}{2}$ inches on each side of the welds. Before or after the exterior enamel coating has been applied, the external welds shall be coated in the same manner.

Sect. 5-3.12—Specials—Cleaning, Lining, and Coating

The resultant cleaning, lining, and coating of specials shall be equivalent to the results of similar work on straight pipe sections. Methods deviating from the prescribed procedure shall be approved

by the engineer. If the shape precludes spinning, the lining and exterior coating shall be applied by hand daubers as follows:

(a) All surfaces shall be double coated by applying the enamel with hand daubers. The final brush strokes of enamel shall be made in the direction of flow and at right angles to the first coat. All brush strokes shall overlap and form a continuous coating or, as an alternate, the daubing may be done by the double lap or "shingling" method. This work shall be done in a workmanlike manner and no indiscriminate smearing of the enamel will be permitted. On all welds the strokes of the first coat of enamel shall be applied along the weld.

(b) Enameling buckets shall be filled from the heating kettles with ladles or from spigots attached to the kettles and shall not be dipped for filling. Buckets shall be kept clean and free of dirt at all times and shall not be set directly upon the ground or on enameled surfaces but shall be set upon suitable pads or blocks. Buckets shall not be allowed to accumulate excess chilled enamel but shall be kept clean.

(c) Where possible, hand enameling (daubing) shall be done from electrically heated or insulated buckets which shall be built and designed and of such capacity best adapted for the work so that they may be easily handled (preferably 2½-gallon capacity). Enamel shall not be used from the enameling buckets below the minimum temperature specified by the manufacturer.

(d) Where overhead hand enameling is necessary inside of pipe or specials, the invert and sides of the pipe shall be protected from drippings and splashings of hot enamel by tarpaulins or heavy tar paper laid in the pipe.

(e) Hand enameling daubers shall be of the size best adapted for the work and shall be subject to the approval of the engineer. Daubers shall be made of the best grade of Tampico Fiber set in solid hardwood handles. Mops, sweeps, or knot daubers shall not be used. Long hand horseshoe daubers will be acceptable for large areas and flat work.

Sect. 5-3.13—Fittings

All fittings such as manholes, service connections, air valves, and blowoff connections shall be protected with coal-tar primer and coal-tar enamel and the same application procedure shall be employed as specified under Sect. 5-3.12 of this specification.

Sect. 5-3.14—Electrical Inspection

(a) The contractor shall conduct electrical inspection of all coating by means of an approved electrical flaw detector delivering a maximum of 10,000 volts at low amperage, during the progress of coating application, and shall repair all defective coating found.

(b) Before final acceptance of coal-tar enamel coating, the entire interior and exterior surfaces of all coated pipe shall be inspected by the engineer and tested for defects by means of an electrical flaw detector and all defects found shall be satisfactorily repaired by and at the expense of the contractor.

Sect. 5-3.15—Use of Whitewash on Exterior Coal-Tar Enamel Coatings

Outside enameled surfaces of all pipe and specials shall be given a coat of water-resistant whitewash immediately following final inspection.

FIELD PROCEDURE AND ENAMELING—SECT. 5-4

Sect. 5-4.1—Transportation and Handling Enameled Pipe

(a) Protected pipe at all times shall be handled with equipment such as stout wide canvas slings and wide padded skids designed to prevent damage to the coating. Bare cables, chains, hooks, metal bars, or narrow skids shall not be permitted to come in contact with the coating. All handling and hauling equipment shall be approved by the engineer before use.

(b) Each length of enameled pipe shall be properly braced with an approved type of spider in each end of the pipe when the deformation of the pipe exceeds two (2) per cent of the diameter. When shipped by rail all pipe shall be carefully loaded on properly padded saddles not less than twelve (12) inches in width. Pipe sections shall be separated so that they do not bear against each other and the whole load must be securely fastened together and to the cars to prevent movement in transit.

(c) In truck shipments, the pipe shall be supported in wide cradles of suitably padded timbers hollowed out on the supporting surface to fit the curvature of pipe, and all chains, cables, or other equipment used for fastening the load must be carefully padded.

(d) The purchaser shall inspect the pipe protection on original carrier at destination, and if the pipe protection is found damaged,

the necessary repairs shall be made as directed by the engineer and/or pipe vendor and at the expense of the pipe vendor.

Sect. 5-4.2—Handling Enameled Pipe in the Field or at Trench

(a) Pipe shall be stored along the trenchside, supported on 4 x 4 in. wooden timbers placed under the uncoated ends of the pipe.

(b) Pipe shall be hoisted from the trenchside to the trench by means of a wide canvas or leather sling. Chains, cables, tongs, or other equipment likely to cause damage to the enamel coating, or dragging or skidding the pipe, will not be permitted. The contractor shall allow inspection of the coating on the under side of the pipe while suspended from the sling. Any damage shall be repaired before lowering the pipe into the trench.

(c) Where the trench traverses rocky ground or ground containing hard objects that penetrate the protective coating, a layer of screened earth or sand not less than three (3) inches in thickness shall be placed in the bottom of the trench prior to installation of pipe.

(d) At all times during erection of the pipe line the contractor shall use every precaution to prevent damage to protective coating on the pipe. No metal tools or heavy objects shall be unnecessarily permitted to come in contact with the finished coating. Workmen will be permitted to walk upon the coating only when necessary and in case of such necessity the workmen shall wear shoes with rubber or composition soles and heels. In large diameter pipe subject to considerable traffic, heavy tar paper shall be laid and maintained in the bottom of the pipe through its entire length as long as there is need of passage through the pipe. This shall apply to all surfaces whether bare, primed, or enameled. Any damage to the protective coating from any cause during the installation of the pipe line and before final acceptance by the purchaser shall be repaired as directed by the engineer by and at the expense of the contractor or laying contractor.

Sect. 5-4.3—Welded or Riveted Field Joints—Coal-Tar Enamel Lining and Coating

(a) The coal-tar primer and coal-tar enamel used shall be the same material as used for coating and lining pipe.

(b) *Interior:* Before field pressure testing, interior welds of field joints shall be cleaned. Primer shall then be applied and allowed to dry according to the coating manufacturer's instructions. Hot enamel shall next be applied with daubers to specified thickness and shall overlap the main body of coating on each side of the weld to

form a continuous coating free from defects. For coating field joints, pour holes shall be located at frequent intervals along the pipe through which hot enamel may be poured into enameling buckets inside the pipe.

(c) *Exterior:* After field pressure tests have been completed, joints shall be cleaned and primed. When the primer is dry, the field joints shall be manually coated to the specified thickness. Enamel shall overlap the coating on each side of the field joint to form a continuous external coating free from defects.

(d) All hand enameling shall be done in accordance with the procedure outlined in paragraphs under Sect. 5-3.12 of this specification and heating of enamel for field application shall be done in accordance with the procedure outlined in paragraphs under Sect. 5-3.5 of this specification.

(e) All field coating work shall be thoroughly inspected by the engineer, using an electrical flaw detector, and any flaws or holidays found shall be repaired by the contractor.

(f) After final inspection, all field applied exterior enamel shall be given a coat of whitewash of the specified composition by and at the expense of the contractor.

Sect. 5-4.4—Mechanical Couplings—Cleaning, Priming, and Coating

All couplings shall be cleaned and primed as specified for the pipe at point of manufacture. The couplings shall be assembled only on pipe ends after any primer that has been applied is thoroughly dry. After installation, the primer coat shall be carefully touched up or reprimed, if necessary, and the exposed portion of the pipe and the coupling shall be coated with a coupler compound or coating recommended by the manufacturer of the coating used on the pipe. This coupler compound or coating shall be applied by pouring into approved coating catch pans designed for the size couplings involved. The compound or coating shall be capable of conforming to the normal movement of the buried pipe, without cracking.

Sect. 5-4.5—Backfilling

Backfilling shall be conducted at all times in a manner to prevent damage and abrasion to coal-tar enamel exterior protection on pipe.

(a) Placing of backfill about exterior protected pipe shall be done only in the presence of the inspector after his final inspection and acceptance of exterior protection on the pipe.

(b) Immediately after placing and aligning pipe in the trench and before completing the joint, loose backfill shall be placed about the

pipe to a depth of one (1) foot above the pipe. This backfill shall consist only of fine soil or sand.

(c) In the event rocks or other hard objects occur in the backfill along any section of the pipe line, such backfill shall be screened before being placed about the pipe or, at the option of the contractor, suitable waste backfill from other parts of the line may be transported to and placed about the pipe in such sections.

(d) Settlement of backfill in the trench shall be by means of flooding and puddling. Tamping, jetting, or rodding with metal rods will not be permitted.

(e) Backfilling about enameled and whitewashed joints or any other part of the pipe that is whitewashed in the field will not be permitted before the whitewash is thoroughly dry.

APPLICATION OF PAINT TO EXPOSED EXTERIOR STEEL SURFACES ERECTED ABOVE GROUND—SECT. 5-5

Sect. 5-5.1—General

Contractor shall furnish all labor, equipment, and materials required and shall prepare and paint all exposed steel surfaces erected above ground. The outside of all pipe above ground exposed to the weather shall receive two (2) coats of red lead primer and one (1) coat of aluminum paint. Each coat of paint shall be applied at the coverage rate of 500 square feet per gallon.

Sect. 5-5.2—Preparation of Exterior Surfaces of Pipe

Preparation of exterior surfaces shall comply in all respects with the procedure outlined in paragraphs under Sect. 5-3.2 of this specification. After completion of field welded joints, they shall be blasted to bright metal before field application of red lead primer.

Sect. 5-5.3—Priming of Exterior Surfaces of Pipe

(a) Red lead primer to be used shall be as specified in paragraphs under Sect. 5-2.7 of this specification. Application of red lead primer shall be as specified for coal-tar priming set forth in Sect. 5-3.3 (a) to (d), inclusive, of this specification and shall be applied at the same time the interior of pipe is primed with coal-tar primer.

(b) Care shall be taken to prevent unnecessary abrasion or scarring of the primed surface before the paint film has dried hard and firm. Any damage to red lead primer shall be repaired before subsequent primer coats are applied. Red lead primer shall be allowed at least twenty-four (24) hours drying time before second coat of red lead primer or white enamel is applied.

Sect. 5-5.4—Second Coating of Exterior Surfaces of Pipe

Material and application for the second coat of red lead primer or white enamel shall comply in all respects to this specification.

Sect. 5-5.5—Finish Coat of Aluminum Paint on Exterior Steel Surfaces

(a) Finish coat shall be aluminum paint applied in the field by air spray gun in one (1) or two (2) coats as specified by the purchaser.

(b) Aluminum paint shall be composed of aluminum vehicle and aluminum bronzing pigment in accordance with this specification. Aluminum paint shall be mixed in the field as required for the work in ratio of two (2) pounds of pigment to one (1) gallon of vehicle. No additional thinner shall be used in the paint.

(c) Before application of finish coat of aluminum paint, the field joints shall be cleaned of all dirt and rust and primed and recoated with the same material in the same manner as prescribed for shop priming of the pipe.

APPENDIX

GENERAL—SECT. A5-1

Sect. A5-1.1—Scope

The foregoing specification covers the material and application requirements necessary to obtain adequate corrosion protection for steel pipe for ordinary service conditions found in water transmission and distribution systems.

This appendix, which covers specifications for materials and application requirements for additional exterior protection to the pipe for the extraordinary or more severe soil conditions, is not a part of the specification unless specifically included by the purchaser as provided for in Sect. 5-1.3 of the specification.

Sect. A5-1.2—Sand Shield

(a) This type of exterior protection shall be used only when the methods of backfill as required in Sect. 5-4.5 of the specification are not available or considered undesirable.

(b) The pipe shall be lined inside and coated outside with coal-tar enamel in accordance with all provisions of the specification. In addition, the entire pipe line, or such portions of the line as designated by the purchaser, shall be completely surrounded by screened sand before any backfill is placed in the trench. A minimum depth of three (3) inches of sand shall be placed in the trench before the pipe is laid and the sand placed about the pipe and to a minimum cover of twelve (12) inches over the pipe. Sand shall pass 100 per cent through a one-fourth ($\frac{1}{4}$) inch mesh screen.

Sect. A5-1.3—Bonded Asbestos Felt Wrapper

(a) This type of exterior protection shall be used only when extreme soil conditions exist.

(b) The pipe shall be lined on the inside and coated on the outside with coal-tar enamel in accordance with all provisions of the specification except that the enamel used on the outside may be the same as that used for inside lining and shall be applied to a thickness of $\frac{3}{32}$ of an inch with an allowable variation of plus or minus $\frac{1}{32}$ of an inch under the asbestos felt.

(c) Asbestos felt shall conform to the material specified in Sect. A5-2.1 of this appendix.

(d) Application of the asbestos felt shall conform to the procedure specified in Sect. A5-3.1 of this appendix.

Sect. A5-1.4—Gunite Shield

(a) This type of exterior protection shall be used only when the following conditions exist:

1. Backfill contains excessive rock content.
2. There is exceedingly large diameter and heavy wall thickness pipe.
3. There are underground water conditions.
4. Extreme soil conditions exist and select backfill is not available.

(b) The pipe shall be lined on the inside and coated on the outside with coal-tar enamel in accordance with all provisions of the specification.

(c) In addition, the pipe shall be coated with a steel reinforced gunite shield. The material used and the application and curing of the gunite shield shall comply with the provisions of this appendix.

MATERIAL SPECIFICATIONS—SECT. A5-2

Sect. A5-2.1—Asbestos Coal-Tar Saturated Felt

The wrapper shall be composed of an asbestos felt having not less than eighty-five (85) per cent asbestos content of the desaturated felt with suitable binder, the whole saturated with a distilled coal-tar to produce the following characteristics in the finished felt:

(a) *Appearance:* The finished tar saturated asbestos felt shall have a calendered surface free from visible external defects. When unrolled at temperatures of from 32 to 100 degrees Fahrenheit, it shall not stick to such an extent as to cause tearing.

(b) *Weight per 100 Square Feet:* Exclusive of all comminuted surfacing or sand which has been added to prevent sticking in the rolls, the weight shall be not less than 13.5 pounds nor more than 15.5 pounds per 100 square feet.

Test Method A.S.T.M. Designation: D 146 – 27, Sections 1–9.

(c) *Breaking Strength:* Average after test samples from the inside of roll have been aged in free air for seventy-two (72) hours.

1. With fiber grain (longitudinal) not less than twenty-five (25) pounds.
2. Across fiber grain (transverse) not less than ten (10) pounds.

Test Method A.S.T.M. Designation: D 146 – 27, Section 12 (a).

(d) *Pliability:* Average after test samples from the inside of roll have been aged in free air for seventy-two (72) hours. No cracking of felt when bent over a 1-inch mandrel at 77 degrees Fahrenheit.

Test Method: With the trimmer described in Section 12 (a),

A.S.T.M. Designation: D 146 – 27, five 6-inch strips shall be cut with the fiber grain as shown at D-1 to D-5 (Figure 1) and immersed in water at 77 degrees Fahrenheit (25 degrees Centigrade) for from ten (10) to fifteen (15) minutes. These strips shall be bent through 180 degrees at a uniform speed, in exactly two (2) seconds, around a mandrel of which the diameter shall be one (1) inch.

(e) *Saturation:* Average after test samples from the inside of roll have been aged in free air for seventy-two (72) hours. The saturated felt shall show not less than thirty (30) per cent nor more than forty (40) per cent of saturant by extraction.

Test Method A.S.T.M. Designation: D 146 – 27, Section 16, omitting correction for entrained carbonaceous materials.

(f) *Loss on Heating:* The loss on heating shall be not more than ten (10) per cent according to the following test method:

Test Method: Cut two (2) samples, six (6) inches wide by twelve (12) inches long, of saturated felt weighing each strip and suspend by wire hooks for two (2) hours in an oven maintained at 200 degrees Fahrenheit, plus or minus 5 degrees Fahrenheit. Care shall be taken to see that the felt does not touch the oven side or other samples of felt and that localized overheating of the samples does not take place. Remove from the oven, cool in a desiccator, and weigh. Compute the percentage of loss in weight based upon the original weight of the sample, minus the weight of surfacing. The average of the result on the two (2) samples shall be reported as the loss on heating.

Sect. A5-2.2—Portland Cement

Portland cement shall conform to the standard specification, A.S.T.M. Designation: C 9 – 37 as adopted by the American Society for Testing Materials, and to all subsequent amendments thereto, except for fineness which shall be as follows:

The cement shall be entirely free of lumps and the residue on a standard No. 200 sieve shall not exceed ten (10) per cent, by weight.

Sect. A5-2.3—Sand

(a) Sand for gunite coating shall consist of natural sand from pits approved by the engineer and shall be washed, if necessary, to meet these requirements. The control of washing of aggregate shall be such that the finer particles of sand are retained or removed as required. Washed or saturated sand shall be allowed to drain at least twenty-four (24) hours to a uniform moisture content before batching. Dry sand shall be moistened before handling, when necessary, to prevent segregation.

(b) Sand shall be composed of clean, hard, strong, durable, uncoated grains, free from shale, lumps, soft or flaky particles, injurious amounts of dust, alkali, organic matter, loam, or other deleterious substances. When tested in accordance with the Standard Method of Test for Organic Impurities in Sands for Concrete (A.S.T.M. Designation: C 40 – 33) of the American Society for Testing Materials, it shall show a color not darker than the standard color and not more than a total of five (5) per cent, by volume, of clay, silt, mica, or other objectionable inorganic materials as determined by settlement after shaking well with two and one-half ($2\frac{1}{2}$) times its volume of three (3) per cent, by weight, solution of sodium hydroxide in a graduated column.

(c) Sand as prepared for use shall be of such quality that 2 x 4 in. mortar cylinders, made with a mixture of cement and the sand under test, shall develop compressive strengths at seven (7) and twenty-eight (28) days of not less than 100 per cent of those developed by a mortar prepared in the same manner with the same cement and graded Ottawa testing sand, all in accordance with the Standard Method of Test for Structural Strength of Fine Aggregate Using Constant Water-cement Ratio Mortar (A.S.T.M. Designation: C 87 – 36) of the American Society for Testing Materials.

(d) The grading of the sand, as determined in accordance with the Standard Method of Test for Sieve Analysis of Aggregates for Concrete (A.S.T.M. Designation: C 41 – 36) of the American Society for Testing Materials, shall be within the following limits:

Sieve Sizes			Min. per cent	Max. per cent
Passing	$\frac{3}{8}$ inch square sieve		———	100
"	$\frac{3}{8}$ " " "	and retained on #4	5	15
"	#4 " "	" #16	20	40
"	#16 " "	" #50	30	50
"	#50 " "		15	25

Sect. A5-2.4—Wire Mesh

Wire mesh for reinforcement of exterior gunite shall be electrically welded wire fabric or woven wire fabric and shall be specially crimped or otherwise self-furring to hold the reinforcement $\frac{3}{8}$ of an inch away from the surface on which it is applied. The wire mesh shall weigh not less than twenty-seven (27) pounds per 100 square feet and the cross-section of metal extending lengthwise of the strip shall be approximately twice the cross-section of the transverse members of the mesh. The reinforcement may or may not be galvanized, at the contractor's option, but in any case it shall be free from paint, other coating material, loose mill scale, dirt, or excessive rust.

Sect. A5-2.5—Sealing Compound

Sealing compound shall be composed of coal-tar pitches and coal-tar solvents suitably blended to produce a liquid coating which can be sprayed or brushed to the wetted surface of the gunite shield.

	Minimum	Maximum
(a) Viscosity—Saybolt Furol, 60 cc. at 60° F. (seconds) A.S.T.M. D 88 - 38	200	250
(b) Water Content A.S.T.M. D 95 - 30	———	0.2 per cent
(c) Specific Gravity at 77° F. A.S.T.M. D 287 - 36	1.10	1.16
(d) Insoluble in CS_2 A.S.T.M. D 4 - 27	———	15 per cent
(e) Distillation by Weight A.S.T.M. D 20 - 30		
To 200° C.	12 per cent	———
To 235° C.	20 per cent	———
To 300° C.	———	40 per cent
(f) Softening point of residue A.S.T.M. D 36 - 26	120° F.	150° F.
(g) Flash point A.S.T.M. D 56 - 36	95° F.	———

APPLICATION PROCEDURES—SECT. A5-3

Sect. A5-3.1—Asbestos Coal-Tar Saturated Felt

Asbestos felt shall be mechanically applied in a continuous end-feed machine or in a lathe type machine or by approved field felt application equipment. Materials shall be of suitable width for the diameter of the pipe to be wrapped for a smooth spiral application, and the material shall be of approximately uniform width. The side lap of the felt shall be not less than one-sixteenth ($\frac{1}{16}$) of the width of the felt and in no case shall be less than one-fourth ($\frac{1}{4}$) of an inch. The felt shall be applied neatly and smoothly and shall be free of wrinkles and buckles.

Sect. A5-3.2—Gunite Shield Application

The application procedure for gunite protection over coal-tar enamel exterior coatings shall be as follows:

(a) Before applying exterior gunite shield over the coal-tar enamel exterior coating, the pipe shall be adequately braced in the interior at the uncoated ends.

(b) Gunite shall have a minimum thickness of $\frac{3}{4}$ of an inch over the coal-tar enamel exterior coating and shall cover the reinforcement at all places.

(c) A first coat of gunite, approximately $\frac{1}{4}$ of an inch thick, shall be applied over the coal-tar enamel exterior coating and shall be allowed to set not less than two (2) hours prior to the attachment of the wire reinforcing mesh, immediately after which it shall be con-

tinuously water-cured by means of an adequate method of sprinkling during the entire period prior to application of the succeeding layers of gunite.

(d) The wire reinforcing mesh shall be applied to the pipe so that the heavier or longitudinal members of the strip extend circumferentially around the outside of the pipe and shall be applied under sufficient initial tension to prevent the freshly applied gunite from sagging from the pipe. Ends of the reinforcing strips shall overlap one (1) full mesh and shall be tied securely at intervals not exceeding twelve (12) inches with No. 16 gage steel wire. Successive circumferential strips of mesh shall have a gap of two (2) inches between them and the longitudinal joint of each course of the mesh shall be staggered with the joints of adjacent courses. The mesh shall be stopped approximately five (5) inches back from the edges of the protective coating and the gunite coatings shall be applied to cover the mesh completely.

(e) Gunite shall be mixed in proportions of one (1) sack of cement (94 pounds) to four and one-half ($4\frac{1}{2}$) cubic feet of sand unless otherwise directed by the engineer. The sand and cement shall be thoroughly mixed in a relatively dry state before being deposited in the placing machine. Machine mixing will be required unless specific authority to use hand mixing is given by the engineer. The machine and its operation will be subject to the approval of the engineer. The mixing operation shall continue for a period of not less than one (1) minute after all sand and cement are placed in the mixer. The sand shall contain, or be moistened with, five (5) per cent to ten (10) per cent of water, by volume, and shall not be mixed with the cement until just before placing in the hopper in order to insure against partial setting of the cement. Dry mixed material shall be used promptly after mixing. Any material that remains in the hopper longer than forty-five (45) minutes after mixing shall be discarded.

(f) Gunite shall be placed with the machine operating at an air pressure of not less than thirty-five (35) pounds nor more than forty (40) pounds per square inch at the gun when 200 feet or less of material hose is used. These pressures shall be increased five (5) pounds for each additional fifty (50) feet of hose and not more than 400 feet of hose shall be used with any machine. The water pressure at the nozzle shall be at least fifteen (15) pounds greater than the air pressure in the machine, and the nozzle used shall be of the type which will secure proper hydration of the mix.

(g) The gunite shall be thoroughly and uniformly hydrated with-

out the use of excess water and shall be shot with the nozzle approximately normal to the surface being covered. Every precaution shall be taken to prevent the occurrence of sand pockets and if any develop they shall be uniformly cut out and replaced with satisfactory machine placed material. No hand patching will be allowed. The contractor shall apply the coating in a manner so that no sloughing shall occur at any time during or following its application.

(h) If for any reason it is necessary to interrupt placing the gunite for a length of time that will result in the material taking a permanent set, a square shoulder shall be formed at the ends of pipe sections and/or elsewhere by shooting against a backing-up strip or by cutting back with a trowel or other suitable tool the irregular edges of the material last placed to a clean unbroken surface perpendicular to the face that will provide a suitable connection or construction joint between such material and the material to be subsequently placed. When performing this work, care shall be taken not to shatter or disturb the material remaining in place nor disturb the imbedded wire mesh. Before placing fresh material against the surfaces of such joints, surfaces shall be carefully cleaned and wetted to insure a good bond between the fresh material and that previously placed.

(i) Gunite shall be cured by the sealing compound method. When gunite has hardened sufficiently to permit sprinkling it shall be thoroughly wetted by sprinkling and maintained in a moist condition until application of sealing compound. Sealing compound shall comply with the material specified in Sect. A5-2.5 of this appendix and shall be applied not less than fourteen (14) hours after application of gunite. Sealing compound may be applied by the brush or spray gun method at a rate of coverage not to exceed 250 square feet per gallon on troweled surfaces and ninety (90) square feet per gallon on rough untroweled surfaces. When the first coat is dry, a second coat shall be applied in the same manner and quantity as the first. When the sealing compound is dry, the pipe shall be given a coat of water-resistant whitewash.

(j) After the application of coal-tar enamel lining and coating on the welded or riveted field joints has been made as required under Sect. 5-4.3 of the specification, the uncoated exterior areas shall be coated with gunite in accordance with the foregoing requirements. In addition, before placing the fresh gunite against the square ends of existing gunite coating at the joints, the surfaces of such ends shall be carefully cleaned and wetted to insure a good bond between the fresh material and that previously placed.

Tentative Standard

American Water Works Association

SPECIFICATION

for

COAL-TAR ENAMEL PROTECTIVE COATINGS FOR STEEL WATER PIPE

OF SIZES OF 4½ INCHES OUTSIDE DIAMETER UP TO BUT NOT INCLUDING 30 INCHES

Prepared by

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These tentative specifications are part of a series of reports by A. W. W. A. Subcommittee 7A. They are as yet in tentative form and are printed for the purpose of bringing them to the attention of the membership of the Association.

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These are not official specifications of the A. W. W. A.; must not be referred to as such; and no authority is given or implied which would permit their use as official documents.—HARRY E. JORDAN, *Secretary, A. W. W. A.*

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Tentative Standard

SPECIFICATION FOR COAL-TAR ENAMEL PROTECTIVE COATINGS FOR STEEL WATER PIPE

OF SIZES 4½ INCHES OUTSIDE DIAMETER UP TO BUT NOT INCLUDING 30 INCHES

GENERAL—SECT. 6-1

Sect. 6-1.1—Purpose

This specification is intended as an aid to the water works engineer in writing specifications for coal-tar enamel protective coatings for steel water pipe of small diameters. It is the result of years of experience in testing, selecting, and applying protective coatings and it represents the most modern practice in the coating industry.

This specification contains the fundamental requirements, in both material and procedure, to obtain corrosion protection for steel water pipe for ordinary service conditions.

An appendix has been added to this specification to provide additional exterior protective measures for the extraordinary or more severe soil conditions.

The purchaser, when inviting bids, shall specify his requirements for protective coating by referring to the designation of this specification and to the section and subdivision of the appendix for the type of additional protection required. In addition, the purchaser shall supply certain detailed information covering each individual contract in accordance with Sect. 6-1.3 of this specification.

Sect. 6-1.2—Scope

(a) This specification covers the material and application requirements to obtain adequate corrosion protection for steel water pipe for conditions ordinarily found in water transmission and distribution systems with coal-tar protective coatings.

(b) Corrosion protection shall be provided as follows:

1. *The inside of all pipe* shall receive a coat of coal-tar primer

followed by a hot coat of coal-tar enamel applied either by manual or mechanical means.

2. *The outside of all pipe to be placed underground* shall receive a coat of coal-tar primer followed by a hot coat of coal-tar enamel into which shall be bonded an asbestos felt wrapper, and finished with a kraft paper or one coat of water-resistant whitewash.

3. *The outside of all pipe to be placed above ground* exposed to the weather shall receive two (2) coats of synthetic red lead primer (or one coat of synthetic red lead primer and one coat of synthetic white enamel) and one (1) coat of aluminum paint.

Sect. 6-1.3—Supplementary Details which shall be Supplied by the Purchaser

(a) Where a steel pipe line is to be laid under conditions ordinarily found in water transmission and distribution systems, reference to the specification shall be as follows:

"The interior surface of all steel pipe shall be cleaned, primed, and lined with coal-tar enamel, and the exterior shall be cleaned, primed, and coated with coal-tar enamel, Type A, with a *bonded* asbestos felt wrapper. All such materials and application shall be in accordance with American Water Works Association Tentative Specification 7A.6."

(b) If additional exterior protection is desired, in the opinion of the engineer, because of extraordinary conditions, the engineer shall designate in his specifications one of the alternate types of exterior protection, provided in the appendix to Sect. 6-1.3.

The following *example* illustrates how such a specification should be written:

"The interior surface of all steel pipe shall be cleaned, primed, and lined with coal-tar enamel, and the exterior shall be cleaned, primed and coated with coal-tar enamel, Type A, and wrapped with bonded asbestos felt wrapper (s). All such materials and application shall be in accordance with American Water Works Association Tentative Specification 7A.6, together with Section (A6-2*) of the appendix of that specification."

(c) In purchasing protection for steel water pipe the purchaser

* Purchaser shall specify the type of exterior protection (A6.2 or A6.3) required because of unusual conditions.

shall make supplementary specific statements in his specification regarding the following:

1. *Project:* Diameter, length, and location of pipe line including maps and drawings necessary to show all details of line within the scope of the contract.

2. *Soil:* Character of soil to be encountered as determined by tests and/or inspection; depth of cover and character of backfill to be used.

3. *Temperatures:* Range of atmospheric temperatures to which the pipe may be subjected during, or subsequent to, installation.

4. *Exterior Protection—Underground:* Length of line to be protected for underground service.

5. *Exterior Protection—Above Ground:* Length of line to be erected above ground for atmospheric service.

6. *Materials:* When "Corrosion Protection" outlined here is to be done by force account or by separate contract, specify:

a. Quantity of coal-tar primer.

b. Quantity and type or types of coal-tar enamel.

c. Quantity of asbestos felt.

d. Quantity of paint or exposed steel surfaces.

(1) Synthetic red lead primer.

(2) Synthetic white enamel.

(3) Aluminum bronzing liquid.

(4) Aluminum pigment.

Sect. 6-1.4—Definitions

Under this Specification the following definitions will apply:

(a) *Purchaser:* The word "Purchaser" shall mean either person, firm, corporation, or governmental subdivision entering into a contract or agreement for the purchase of any materials and/or any work to be performed under this specification.

(b) *Contractor:* The word "Contractor" shall mean the person, firm, or corporation executing the contract or agreement with the purchaser to furnish any material and/or to perform any work under this specification.

(c) *Engineer:* The word "Engineer" shall mean the engineer or inspector employed by the purchaser and acting as his representative; their respective assistants properly authorized and limited to the particular duties assigned to them; or to the purchaser, himself, acting as his own engineer.

(d) *Blasting:* The word "Blasting" shall mean blasting with

standard sand blasting sand or steel grit to clean and thoroughly remove all rust and mill scale from the steel.

(e) *Centrifugal Casting:* The words "Centrifugal Casting" shall mean the process of applying coal-tar enamel to the inside surface of pipe whereby molten coal-tar enamel introduced into the pipe is spread on the surface of the pipe and held thereon by the centrifugal force developed by rotating the pipe about its longitudinal axis until the coal-tar enamel has cooled and solidified and become bonded to the pipe.

Sect. 6-1.5—Inspection

(a) When specified by the purchaser all coating work to be acceptable must be applied in the presence of his Inspector, and all work done in his absence will be subject to rejection unless the continuance of the work during his absence is specifically allowed by the inspector. If at any time it is found that the procedure of applying the protective coating material is not in accordance with this specification, all such coating work may be rejected.

(b) *Access for Inspector:* The inspector shall have free access to those parts of all plants that are concerned with the furnishing of materials or the performance of work under this specification.

(c) *Facilities for Inspector:* The contractor shall furnish the inspector reasonable facilities and space for the inspection and obtaining of information respecting the character of material used and the progress and manner of the work.

Sect. 6-1.6—Material and Workmanship

All material furnished by the contractor shall be of the specified quality. All work shall be done in a thorough workmanlike manner. The entire operation of priming the pipe and heating and applying the coal-tar enamel coatings shall be performed under the supervision of experienced men skilled in the application of coal-tar enamel.

Sect. 6-1.7—Equipment

Contractor's equipment for all cleaning, priming, enameling and painting shall be designed and manufactured and shall be in such condition as to permit applicators to follow the procedure and obtain results prescribed in this specification.

Sect. 6-1.8—Packaging

All coal-tar enamel, primers, asbestos felts and kraft papers purchased or used under this specification shall be packaged in suitable and approved containers or packages.

Sect. 6-2.1—Coal-Tar Primer

All coal-tar primer to be used under this specification shall comply with the following:

(a) The primer shall consist of unadulterated coal-tar pitch and refined coal-tar oils only, suitably blended to produce a liquid coating which may be applied cold by brushing or spraying and which will produce suitable bond between the metal and subsequent coating of coal-tar enamel. Primer shall contain no benzol or other toxic or highly volatile solvents and no added pigments or inert fillers, or other substances, and shall show no tendency to settle out in the container.

(b) The primer shall have good spraying, brushing, leveling properties, and a minimum tendency to produce bubbles during application. Primer shall dry hard to the touch when applied as recommended.

Sect. 6-2.2—Type A Coal-Tar Enamel

Type A Enamel, because of certain steel pipe handling and/or construction conditions, shall be used as *interior lining* or *exterior protection,* as specified and/or agreed to by the purchaser and contractor, at any period during the performance of the work.

This enamel shall be composed of a specially processed coal-tar pitch combined with an inert mineral filler. No asphalt of either petroleum or natural base shall be acceptable as part of the ingredients. The enamel shall have the following characteristics:

	Minimum	Maximum
Softening point—A.S.T.M. D 36-26	220° F.	———
Filler (ash)—A.S.T.M. D 271-37	25 per cent	35 per cent
Fineness filler, through 200 mesh—A.S.T.M. D 7-27	90 per cent	———
Specific Gravity at 25° C.—A.S.T.M. D 71-27	1.40	1.60
Penetration—A.S.T.M. D 5-25		
At 77° F.—100 gram wt.—5 sec.	7	16
At 115° F.—50 gram wt.—5 sec.	15	35
High temperature test—at 160° F.—(sag) Test Method Sect. 6-2.4 (d) 1	———	$\frac{2}{32}$ in.
Low temperature test—at minus 20° F.—(cracking)—Test Method Sect. 6-2.4 (d) 2	———	None
*Deflection test (Initial Heating)—Test Method Sect. 6-2.4 (d) 3		
Initial Crack	0.8 in.	———
Disbonded Area	———	3.0 sq.in.
*Deflection test (After Heating—Test Method Sect. 6-2.4 (d) 4		

Initial Crack	0.6 in.	———
Disbonded Area	———	5.0 sq.in.
*Impact test—at 77° F.—650 gr. ball—8 ft. drop—Test Method Sect. 6-2.4 (d) 6		
Direct Impact—Disbonded area	———	10.0 sq.in.
Indirect Impact—Disbonded area	———	2.0 sq.in.
Peel test—Test Method Sect. 6-2.4 (d) 5	None at any temperature up to and including 160° F.	

* *Note:* Choice of bond testing methods "A" or "B"—by deflection (before heating), by deflection (after heating) or by impact, shall depend on laboratory equipment available.

Sect. 6-2.3—Contractor's Samples and/or Detailed Information

(a) When specified by the purchaser, the contractor shall furnish the purchaser for testing, a fifty (50) pound sample of the coal-tar enamel and one (1) quart sample of the coal-tar primer, *or* a certified copy of results of test made by the manufacturer covering physical and performance characteristics of the enamel and primer used.

(b) Samples submitted to the purchaser will be tested in the purchaser's laboratory or in a responsible commercial laboratory designated by the purchaser.

(c) The expense of testing of all samples of material supplied by the contractor will be borne by the purchaser.

(d) When requested by the purchaser the contractor shall submit the coating manufacturers' detailed specifications of the coal-tar enamel and coal-tar primer supplied for the project, with instructions for the handling and application of the material; this information shall include:

1. Method of application of primer and coverage in square feet per gallon.
2. Minimum and maximum drying time of the primer before application of enamel.
3. Application temperature of enamel.
4. Maximum allowable temperature to which enamel may be heated.
5. Maximum time enamel may be held in heating kettles at application temperature.

(e) When requested by the purchaser, the contractor shall furnish or allow the purchaser to collect samples of the material representative of each batch of enamel and/or primer. Certified test reports and samples furnished by the contractor shall be properly identified to each batch of enamel and/or primer.

Sect. 6-2.4—Test Procedure for Primer and Enamels

Tests to determine physical characteristics of enamel and primer furnished by the contractor or collected by the purchaser shall be in accordance with the American Society for Testing Materials Standard Designations as indicated in Sect. 6-2.2 of this specification. The preparation of test specimens and the testing for performance characteristics by methods other than A.S.T.M. procedures shall be tested in accordance with the following procedure:

(a) *Preparation of Test Plates:* All performance tests shall be made on new mild steel plates that are flat and true to dimension. One side of each plate shall be freshly blasted to a uniform steel gray surface, completely removing stains, rust, mill scale, et cetera. For blasting, a sharp dry sand having a minimum of 50 per cent retained on a 60-mesh screen or a No. 50 steel grit shall be used with an air pressure of not less than 50 pounds per square inch.

(b) *Priming of Test Plates:* All test plates shall be primed in accordance with the manufacturer's instructions for the material being tested; that is, number and method of applications, coverage per square foot, drying time, et cetera.

(c) *Preparation of Enamel for Testing:* Thirty (30) pounds of enamel broken into pieces approximately four (4) inches maximum dimension shall be rapidly melted over a large gas burner in a metal container of uniform cross section not less than eight (8) inches nor more than twelve (12) inches in diameter. Immediately upon reaching the specified application temperature the enamel shall be applied to the test plates required for high temperature and low temperature performance, Method A or Method B; deflection test (initial heating), Method A; peel test; and impact test, Method B. The remaining enamel in the container, which shall be not less than twenty (20) pounds, shall be maintained at the recommended application temperature for a two-hour period. The enamel shall be stirred with a metal bar at intervals of fifteen (15) minutes during the heating period. A one-fourth ($\frac{1}{4}$) inch steel plate shall be interposed between the container and gas flame to avoid superheating. After the two-hour heating period this enamel shall be applied to the test plates required for "*Deflection Test (after two-hour heating), Method A.*" The application temperatures and method of application shall be as recommended by the coating manufacturer. The enamel shall be applied to a thickness of $\frac{2}{32}$ of an inch to $\frac{3}{32}$ of an inch for all test plates.

(d) *Testing Procedure:* Depending on the laboratory equipment

available, either Method A or Method B shall be used for the following tests:

1. *High Temperature Test:*

a. *Method A:* Two 12 x 4 x $\frac{3}{16}$ in. plates prepared as above, on which shall be scribed three (3) lines at 3-inch intervals across the enamel surface, shall be tested as directed under "Procedure."

b. *Method B:* Two 12 x 12 x $\frac{7}{64}$ in. plates prepared as above with a one-half ($\frac{1}{2}$) inch uncoated border left around the four (4) edges of the plates, on which shall be scribed lines one (1) inch apart across the face of the enamel and continued on the uncoated surface of the plate to the edges, shall be tested as directed under "Procedure."

c. *Procedure:* The plates as prepared for Method A or Method B shall be stored in a vertical position in a chamber, the temperature of which shall be controlled for twenty-four (24) hours at 160 degrees Fahrenheit. At the end of this period the plates shall be removed and cooled to room temperature and the average sag of the lines on the two (2) plates shall be recorded as sag of the enamel.

2. *Low Temperature Test:* After the two (2) plates, prepared as in Method A or Method B, have been used in the above test, they shall be placed in a chamber, the temperature of which shall be controlled for a 6-hour period at minus 20 degrees Fahrenheit. At the end of this period the plates shall be removed and allowed to reach room temperature, then examined for evidence of cracking and/or disbonding of the enamel.

3. *Deflection Test (Initial Heating):* Four (4) plates, 10 x 4 x $\frac{1}{16}$ in., prepared as above for testing under Method A, shall be stored in a chamber, the temperature of which shall be controlled at 40 degrees Fahrenheit. After a 6-hour period the plates shall be tested for deflection on equipment in this chamber by supporting the plates on one-eighth ($\frac{1}{8}$) inch radius knife edges which are spaced on $9\frac{1}{2}$ inch centers. The deflecting load shall be centrally applied across the plate by a one-half ($\frac{1}{2}$) inch radius mandrel at the rate of one (1) inch per minute (to produce tension in the enamel) until cracking occurs, as indicated by an electrical holiday detector. The deflection producing the initial cracking shall be recorded and the deflection shall then be continued to a maximum distance of $1\frac{1}{2}$ inches. The specimen shall then be removed from the machine for examination. All disbonded enamel shall be removed from the

plate and the area of metal exposed on the four (4) plates shall be measured. The average results of initial cracking and disbonded area shall be recorded.

4. *Deflection Test (after two-hour heating):* Four (4) plates, 10 x 4 x $\frac{1}{16}$ in., prepared as above for testing under Method A, shall be used in this test. The procedure shall be the same as described in Sect. 6-2.4 (d)3 above and the average results of initial cracking and disbonded area shall be recorded.

5. *Peel Test:* One (1) plate, 12 x 12 x $\frac{1}{2}$ in., shall be prepared as above for testing and after the application of enamel, this plate shall be allowed to cool to room temperature. The condition of bond shall be tested over a temperature range of 80 degrees to 160 degrees Fahrenheit at successive intervals of 20 degrees Fahrenheit, that is, 80 degrees, 100 degrees, 120 degrees, 140 degrees, 160 degrees Fahrenheit. The test shall be made at the temperatures indicated by immersing the plates for a period of approximately one-half ($\frac{1}{2}$) hour in a water bath maintained at the selected temperature. At the end of each of these periods the plate shall be removed from the bath and immediately tested for peel. This shall be done by attempting to peel, strip, or lift the enamel from the plate by means of a knife blade inserted between the enamel and an edge of the plate. Adhesion of the enamel at each of the indicated test temperatures, to the extent of preventing peeling, stripping, or lifting, shall be recorded as no peeling. The use of the water bath for the 80 degrees Fahrenheit test may be omitted when the room temperature closely approximates 80 degrees Fahrenheit.

6. *Impact Test:* The 12 x 12 x $\frac{7}{64}$ in. plates, prepared as above and used under test procedures Sect. 6-2.4 (d)1 and 6-2.4 (d)2 under Method B, shall be allowed to reach room temperature and then shall be immersed in a water bath held at a uniform temperature of 77 degrees Fahrenheit for a period of at least one (1) hour before testing. Each plate shall be removed from the water bath, dried with a soft clean cloth, and immediately subjected to the impact test.

a. *Direct Impact:* Each plate shall be supported on the true plane surface of a block of wood. A 650-gram steel ball with a well polished spherical surface shall be dropped from a height eight (8) feet above the surface of the plate. The ball shall be dropped so as to strike the enamel at a point at least four (4) inches from any edge of the plate. After one (1) such impact the enamel shall be examined for evidence of shattering and loosening from the plate.

b. *Indirect Impact:* After being subjected to direct impact, plates shall then be placed with the coated face down on a wooden block through which a $3\frac{1}{2}$ inch diameter hole has been cut. The same ball shall then be dropped from a height of eight (8) feet above the surface of the plate, so as to strike the steel plate at a point over the center of the hole in the wooden support block. The point of impact shall be at least four (4) inches from any edge of the plate and shall be at least three (3) inches from the point of direct impact. After one (1) such impact the enamel shall be examined for evidence of shattering and loosening of the coating.

Coating that has been knocked off the plate by the impact of the steel ball shall be considered as shattered coating. Loose coating is coating that has not shattered but can be easily and readily removed from the plate by fingers or, with very little force, by the use of a knife blade or similar instrument. After removal, the area of loosened coating shall be determined.

Sect. 6-2.5—Asbestos Coal-Tar Saturated Felt

The wrapper shall be composed of an asbestos felt having not less than eighty-five (85) per cent asbestos content of the desaturated felt with suitable binder, the whole saturated with a distilled coal tar to produce the following characteristics in the finished felt:

(a) *Appearance:* The finished tar saturated asbestos felt shall have a calendered surface free from visible external defects. When unrolled at temperatures of from 32 to 100 degrees Fahrenheit, it shall not stick to such an extent as to cause tearing.

(b) *Weight per 100 Square Feet:* Exclusive of all comminuted surfacing or sand which has been added to prevent sticking in the rolls, the weight shall be not less than 13.5 pounds nor more than 15.5 pounds per 100 square feet.

Test Method: A.S.T.M. Designation: D 146 – 27, Sections 1-9.

(c) *Breaking Strength:* Average after test samples from the inside of roll have been aged in free air for seventy-two (72) hours.

1. With fiber grain (longitudinal) not less than twenty-five (25) pounds.
2. Across fiber grain (transverse) not less than ten (10) pounds.

Test Method: A.S.T.M. Designation: D. 146 – 27, Section 12 (a).

(d) *Pliability:* Average after test samples from the inside of roll have been aged in free air for seventy-two (72) hours. No cracking of felt when bent over a 1-inch mandrel at 77 degrees Fahrenheit.

Test Method: With the trimmer described in Section 12 (a), A.S.T.M. Designation: D 146 – 27, five 6-inch strips shall be cut with the fiber grain as shown at D-1 to D-5 (Figure 1) and immersed in water at 77 degrees Fahrenheit (25 degrees Centigrade) for from ten (10) to fifteen (15) minutes. These strips shall be bent through 180 degrees at a uniform speed, in exactly two (2) seconds, around a mandrel of which the diameter shall be one (1) inch.

(e) *Saturation:* Average after test samples from the inside of roll have been aged in free air for seventy-two (72) hours. The saturated felt shall show not less than thirty (30) per cent nor more than forty (40) per cent of saturant by extraction.

Test Method: A.S.T.M. Designation: D 146 – 27, Section 16, omitting correction for entrained carbonaceous materials.

(f) *Loss on Heating:* The loss on heating shall be not more than ten (10) per cent according to the following test method:

Test Method: Cut two (2) samples, six (6) inches wide by twelve (12) inches long, of saturated felt, weighing each strip, and suspend by wire hooks for two (2) hours in an oven maintained at 200 degrees Fahrenheit, plus or minus 5 degrees Fahrenheit. Care shall be taken to see that the felt does not touch the oven side or other samples of felt and that localized overheating of the samples does not take place. Remove from the oven, cool in a desiccator, and weigh. Compute the percentage of loss in weight based upon the original weight of the sample, minus the weight of surfacing. The average of the result on the two (2) samples shall be reported as the loss on heating.

Sect. 6-2.6—Kraft Paper

The kraft paper shall be an 80-pound, 100 per cent sulfate, smooth. It may be imprinted at intervals with the name of the applicator or steel pipe manufacturer.

Sect. 6-2.7—Whitewash Formula

All whitewash to be used shall be mixed in accordance with the following formula:

(a) *Ingredients:*

50 gallons water
1 gallon boiled linseed oil
150 pounds processed quick lime
10 pounds salt

(b) *Mixture:* Lime and oil shall be slowly added simultaneously to the water and mixed thoroughly. The mixture shall be allowed to stand for not less than three (3) days before it is used.

Sect. 6-2.8—Synthetic Red Lead Primer

The paint to be used for the first and second exterior coats on steel structures erected above ground shall comply with the following:

(a) The red lead primer shall be a ready mixed paint composed of red lead pigment and synthetic resin vehicle well ground together to produce a liquid coating which may be applied by brushing or spraying and which will dry rapidly and provide a suitable bond between the metal and subsequent coating of paint. The primer shall contain no benzol or other toxic solvent and shall show no tendency to jell or liver in the container.

(b) The primer shall possess the following physical characteristics:

1. Viscosity at 77°F.—30–50 seconds Gardner Mobilometer (Solid Plunger) 150 gram total weight, 10 cs drop.
2. Weight per gallon—20–22 pounds A.S.T.M. D 287 - 33.
3. Dry red lead (97 per cent Pb_3O_4) minimum 70 per cent by weight.
4. Varnish vehicle (synthetic resin type) maximum 30 per cent by weight.

(c) The vehicle shall be a synthetic resin varnish consisting of either an alkyd or phenol-formaldehyde resin with the necessary vegetable oils and volatile thinners to produce elasticity, waterproofness, adherence, and durability in the finished paint film.

(d) The red lead primer shall have satisfactory working properties defined as:

The red lead primer shall be readily broken up with a paddle to a smooth uniform paint suitable for brushing or spraying with the addition of not more than ten (10) per cent, by volume, of a suitable non-toxic thinner. The red lead primer applied by either method shall have good self-leveling properties, both of the vehicle and the pigment, and when brushed or sprayed on a vertical surface at a coverage rate of 500 square feet per gallon, shall dry hard and elastic without running, streaking, or sagging. The drying properties shall be such that the primer film will dry dust free and free to touch in one (1) hour, and dry to a smooth hard film in six (6) hours. The primer film produced shall have a flat or semi-gloss finish after twenty-four (24) hours drying.

(e) Red lead primer shall be packaged in iron pails of five (5) gallon maximum capacity.

Sect. 6-2.9—Synthetic White Enamel

When pipe to be erected above ground is installed during hot weather, the second coat of primer shall be synthetic white enamel

in place of synthetic red lead primer. Synthetic white enamel shall comply with the following:

(a) The synthetic white enamel shall be a ready mixed paint composed of titanium oxide pigment and alkyd resin vehicle well ground together to produce a liquid coating which may be applied readily by brushing or spraying, which dries rapidly, and which provides a suitable bond with the synthetic red lead primer over which it is applied. The white enamel shall contain no benzol or other toxic solvent and shall have a minimum tendency to settle out the pigment in the container. The composition of the paint shall be as follows:

Pigment (100 per cent titanium oxide)	25 per cent
Varnish vehicle (alkyd resin type)	75 per cent

(b) The vehicle shall be of the alkyd resin type and shall contain forty (40) per cent non-volatile solids. The volatile constituents shall be seventy (70) per cent coal-tar hydrocarbon solvents and thirty (30) per cent high flash naphtha.

(c) The synthetic white enamel shall have satisfactory working properties defined as follows:

The white enamel shall be readily broken up with a paddle to a smooth uniform paint suitable for brushing or spraying with addition of not more than ten (10) per cent of a suitable nontoxic thinner. The white enamel as applied by either method shall have good self-leveling properties and when brushed or sprayed on a vertical surface at a coverage rate of 500 square feet per gallon shall dry hard and elastic without running, streaking, or sagging. The drying properties shall be such that the paint film will dry dust free and free to touch in one (1) hour and dry to a smooth hard film in twenty-four (24) hours. The film when dried shall show a strong tendency to chalk on the surface when exposed to the weather.

Sect. 6-2.10—Aluminum Bronzing Liquid

(a) The vehicle for aluminum paint shall be composed of treated oils, resins, metal driers, and volatile thinners. Treated oils shall be manufactured from the highest grade of spar varnish and linseed and chinawood oils. Resins employed shall be the so-called synthetic type, representing three (3) distinct types, which shall perform the double duty of setting and drying the oil film through in the shortest possible time and increase the resistance of the film to acids and alkalis and weathering. Solvents shall be a mixture of turpentine, coal tar, and petroleum thinners designed to evaporate just rapidly

enough to promote the proper speed of drying without impairing the working qualities of the vehicle and shall be of proper blend required to produce the maximum floating of the aluminum bronze.

(b) The vehicle shall conform to the following tests:

1. *Appearance:* Clear and transparent.

2. *Color:* Not darker than tube No. 14 of Gardner Color Standards for Varnishes and Lacquers.

3. *Flash Point:* Not below 86 degrees Fahrenheit.

4. *Non-Volatile Matter:* Not less than fifty (50) per cent, by weight.

5. *Viscosity at 77 degrees Fahrenheit:* 0.5 to 1.0 poises. (Tubes A to D Gardner-Holt Standards.)

Test procedure indicated in A.S.T.M. Serial Designation: D 154 – 28.

(c) The vehicle shall have the following physical properties:

1. Set to touch in not more than three (3) hours at 70 degrees Fahrenheit, sixty-five (65) per cent relative humidity.

2. Dry hard in not more than twenty-four (24) hours at 70 degrees Fahrenheit.

3. When mixed with aluminum bronzing pigment in the ratio of two (2) pounds of pigment to one (1) gallon of vehicle, the resulting paint shall have good flowing, covering, and leveling properties with the ability to float aluminum bronze flakes to the surface uniformly without allowing the bronze to break or separate before setting. The paint shall be readily appliable by air spray gun methods and when applied to a vertical steel surface in the coverage rate of 300 to 400 square feet per gallon the paint film so applied shall dry without running, streaking, sagging, or wrinkling. The paint when dry shall have high light reflective properties.

Sect. 6-2.11—Aluminum Bronzing Pigment

The aluminum bronzing pigment shall conform to the following Federal Specifications for the respective grades designated:

(a) Standard Varnish Grade Powder—Federal Specification No. TT-A-476, Type A.

(b) Standard Paste—Federal Specification No. TT-A-466.

SHOP APPLICATION OF COAL-TAR PRIMERS AND ENAMELS—SECT. 6-3

Sect. 6-3.1—General

The contractor shall furnish all labor, equipment, and material required, shall prepare all surfaces to be coated, and shall apply the coal-tar primer and coal-tar enamel to all interior and exterior surfaces to be coated.

Sect. 6-3.2—Preparation of Surfaces

(a) *Mechanical Cleaning:* Before blasting, all oil and grease on the surfaces of the metal shall be removed thoroughly by flushing and wiping using "Xylol," or other suitable coal-tar base solvents, and clean rags. The use of dirty or oily rags or solvent will not be permitted. All other foreign matter shall be removed by buffing or by scraping and wire-brushing. After cleaning, the pipe shall be protected from and maintained free of all oil, grease, and dirt that might fall upon the pipe from whatever source until the pipe has received its final enamel coat. All metal surfaces shall be thoroughly blasted to bright metal satisfactory to the engineer. At the option of the contractor, steel grit blasting may be used as an alternate to sand blasting to thoroughly remove rust and scale. Blasted surfaces that rust before a priming coat has been applied shall be cleaned of all rust by buffing or wire-brushing or, at the discretion of the engineer, shall be re-blasted. Adequate air separators shall be used to remove effectively all oil and free moisture from the air supply to the blaster. Any pipe showing pits after beginning of blasting shall be set aside immediately pending examination by the engineer for approval, reconditioning, or rejection.

(b) *Pipe Mill Practice:* In rapid production pipe mills the interior of the pipe shall be cleaned by blasting or by pickling-and-washing until neutral to litmus or by rattling. The exterior of the pipe shall be cleaned by blasting, pickling-and-washing, by immersion in caustic bath followed by washing until neutral to litmus or by mechanical scarifying and wire-brushing and washing with coal-tar solvent; or a combination of these methods may be used that will result in the surfaces being free and clean of all loose mill scale, rust, dirt, oil, grease, moisture, or other objectionable matter. All pipe shall be immediately primed with coal-tar primer after the cleaning operation.

Sect. 6-3.3—Coal-Tar Priming

The coal-tar primer shall be as specified in the paragraphs under Sect. 6-2.1 of this specification and the application shall be as follows:

(a) All surfaces shall be cleaned of dust and grit by brushing and air blowing and shall be *primed immediately following cleaning.* The surfaces shall be dry at the time the coal-tar primer is applied and no primer shall be applied during rain or fog unless protected from the weather by suitable housing.

(b) At the option of the contractor, the application of the primer shall be by hand brushing, air gun spraying, or spraying-and-brushing, and shall be in accordance with instructions for application as supplied by the manufacturer of the primer. The apparatus to be used for application of the primer shall be approved by the engineer. Spray-gun apparatus to be used shall include a mechanically agitated pressure-pot and an air separator that will remove all oil and free moisture from the air supply.

(c) The use of coal-tar primer that becomes fouled with foreign substances or has thickened through evaporation of the solvent oils will not be permitted.

(d) After application, the coal-tar priming coat shall be uniform, free from floods, runs, sags, drips, holidays, or bare spots. Any bare spots or holidays shall be recoated with an additional application of primer. All runs, sags, floods, or dips shall be removed by scraping and cleaning and the cleaned area retouched or, at the discretion of the engineer, all such defects shall be remedied by reblasting and repriming. Suitable measures shall be taken to protect applied primer from contact with rain, fog, mist, spray, dust, or other foreign matter until completely hardened.

(e) In cold weather when the temperature of the steel is below 45 degrees Fahrenheit or at any time when moisture collects on the steel, the steel shall be warmed to a temperature of approximately 100 degrees Fahrenheit for sufficient time to dry the pipe prior to priming. To facilitate spraying and spreading, the primer may be heated and maintained during the application at a temperature of not more than 100 degrees Fahrenheit.

(f) The minimum and maximum allowable drying time of the coal-tar primer between application of primer and application of coal-tar enamel shall be in accordance with instructions issued by the manufacturer of the primer unless otherwise directed by the engineer. If the enamel is not applied within the maximum time after priming, as required by the manufacturer or as directed by the

engineer, the pipe shall be reprimed with an additional light coat of primer or, at the discretion of the engineer, the entire prime coat shall be removed by re-blasting and the pipe reprimed.

Sect. 6-3.4—Preheating of Primed Pipe

(a) At all times during cold weather when pipe temperature is below 45 degrees Fahrenheit or during rainy or foggy weather when moisture tends to collect on cold pipe, enameling shall be preceded by warming the pipe.

(b) Warming shall be done in a preheating oven, or in rooms maintained at recommended temperature by indirect heat while pipe is on spinning rolls, or by any other method which will heat pipe uniformly to recommended temperature without injury to primer. Steel temperature of pipe shall not exceed 125 degrees Fahrenheit.

(c) After heating and while pipe is at its highest temperature, inside lining enamel shall be applied. Coating of the outside of the pipe with coal-tar enamel shall proceed immediately after the spinning operation is completed while the pipe is still warm from preheating and centrifugal casting.

(d) The same procedure shall apply for pipe primed on the outside with synthetic red lead primer except that the second coat of paint need not be applied while the pipe is hot.

Sect. 6-3.5—Coal-Tar Enamel Application

The type of coal-tar enamel to be used for the interior lining and the exterior coating shall be in accordance with Sect. 6-2.2 of this specification. The application shall be as follows:

(a) *Heating of Coal-Tar Enamel:* The enamel shall be heated in approved heating kettles equipped with accurate and easily read thermometers. In addition, the purchaser reserves the right to provide recording thermometers; such thermometers shall be installed on the heating kettles as directed by the engineer and at the expense of the contractor. Such thermometers will be checked and adjusted by the engineer whenever necessary. The charts therefrom shall constitute a basis for acceptance or rejection of any enamel because of improper heating and/or handling.

(b) The operating and/or supply kettles shall be provided in sufficient numbers so that the enamel may be heated and coordinated with the application procedure. No enamel shall be held in the operation kettles at application temperatures for a longer period than recommended by the manufacturer and as stated in his in-

structions. The enamel heated in supply kettles shall not exceed the temperatures and melting periods as recommended by the coating manufacturer. Operating kettles shall not be used as a continuous source of supply by adding unmelted enamel during the time they are in use but shall be completely emptied of one charge and cleaned, if necessary, before the next charge of unmelted enamel is added; except in the practice of field patching, the engineer may permit continuous use of a heating kettle not exceeding fifty (50) gallon capacity. Kettles shall be covered with hinged lids which may be securely fastened down and shall be tightly closed during the heating and application of enamel except for necessary loading and stirring.

(c) The enamel shall be maintained moisture and dirt free at all times prior to and at the time of heating and application.

(d) In loading the kettles the enamel shall be broken into pieces not exceeding ten (10) pounds.

(e) In heating the enamel the charge shall be melted and brought up to application temperature as rapidly as possible without injury to the enamel. The temperature at which the enamel will be applied shall be in accordance with the recommendation furnished by the manufacturer. The hot enamel shall be thoroughly stirred at intervals not exceeding fifteen (15) minutes regardless of whether the enamel is being used from kettles or is being held ready for use. Iron paddles shall be used for stirring; wooden paddles will not be permitted.

(f) The maximum allowable temperature to which enamel may be heated and the maximum allowable time that the enamel may be held in the kettles at application temperature shall be in accordance with the instructions supplied by the manufacturer.

(g) Enamel that has been heated in excess of the maximum allowable temperature, or that has been held at application temperature for a period in excess of that specified, shall be condemned and rejected. Fluxing the enamel will not be permitted.

(h) Excess enamel remaining in a kettle at the end of any heat shall not be included in a fresh batch in an amount greater than ten (10) per cent of the batch. Kettles shall be emptied and cleaned at least once in any 24-hour period. The material removed in cleaning the kettles shall be dumped and wasted.

Sect. 6-3.6—Application of Coal-Tar Enamel to Interior Surfaces

(a) The primed steel surface to be enameled shall be dry and clean at the time the enamel is applied. No enamel shall be applied during cold weather, rain, or fog unless the pipe is preheated and/or protected by suitable housing.

(b) The application of the enamel to the inside surface of all pipe other than specials shall be by centrifugal casting by either the Trough Method (Sect. 6-3.7 of this specification) or by the Retracted Weir or Feed Line Method (Sect. 6-3.8 of this specification).

(c) During application of enamel, the pipe shall be revolved at the speed best suited to produce a smooth glossy lining of uniform thickness. Finished coal-tar enamel lining shall be free from wrinkles, sags, blisters, or blow holes. Thickness of lining shall be $\frac{3}{32}$ of an inch and the allowable variations in thickness shall not exceed plus or minus $\frac{1}{32}$ of an inch. All pieces of lined pipe in which excessive rough areas appear or other irregularities exist that are unsatisfactory to the engineer shall be stripped of the entire lining and relined as herein required for original lining.

(d) All kettles shall be equipped with adequate screens to prevent particles of foreign matter or other deleterious materials from appearing in the finished coating.

(e) Water used for chilling the enamel lining following centrifugal casting shall not be applied until the enamel has hardened sufficiently to prevent water marks.

Sect. 6-3.7—Centrifugal Casting of Coal-Tar Enamel by the Trough Method

(a) Pipe shall be rotated on rubber tired or steel wheels with suitable guards to prevent pipe from leaving the rolls during spinning operations.

(b) Molten enamel shall be introduced into pipe by a pouring trough extending the full length of pipe in either one (1) or two (2) sections. Pouring trough shall be level and shall have a straight and even pouring lip. Trough may be heated either by electrical heating elements or by a gas flame to a temperature best adapted to the equipment available.

(c) Transfer of molten enamel from kettles to pouring troughs shall be conducted in such a manner as to prevent excessive loss of heat. Hot enamel shall be held in the pouring troughs between filling and pouring for not more than one (1) minute. Enamel shall not be poured from troughs into the pipe until the pipe has reached its maximum speed of rotation.

(d) Enamel shall be poured by inverting the trough with a uniform rotation and at such speed as to distribute the enamel evenly throughout the pipe.

(e) Immediately after the pouring operations the trough shall be righted and removed from the pipe and cleaned, when necessary, of all excess enamel remaining in the trough. Such enamel may be

re-used if it is clean and free of dirt by adding to fresh batches in quantities not exceeding ten (10) per cent of unmelted enamel.

Sect. 6-3.8—Centrifugal Casting of Coal-Tar Enamel by the Retracting Weir or Feed Line Method

(a) Pipe shall be rotated on rubber tired wheels with suitable guards or hold-down wheels to prevent the pipe from leaving the rolls during spinning operations.

(b) The hot enamel shall be introduced into the rotating pipe by means of a retractable feed line or over a traveling weir whose pouring lip is parallel to the longitudinal axis of the pipe. In either case the discharge element of the supply mechanism shall travel the entire length of the pipe. The speed of travel shall be properly coordinated with the speed of rotation to insure complete multiple application of the molten enamel.

(c) Molten enamel shall be supplied to the weir or feed line from a reservoir through supply pipes and maintained at application temperature by means of insulation and by the use of suitable methods of heating both reservoir and supply line. Supply of enamel shall be by means of a power driven circulation pump.

Sect. 6-3.9—Application of Coal-Tar Enamel and Wrapping to Exterior Surfaces

(a) The primed steel surface to be enameled shall be dry and clean at the time the enamel is applied. Any damage occurring to the primer coat shall be repaired by retouching before application of the enamel.

(b) External enamel and asbestos felt wrapper shall be applied to the revolving pipe so as to produce a coal-tar enamel coating to a thickness of $\frac{3}{32}$ of an inch and the allowable variation in the enamel thickness shall not exceed plus or minus $\frac{1}{32}$ of an inch. The asbestos felt shall be definitely and positively bonded to the enamel. The enamel coating shall be continuous and free from defects, skips or holidays.

(c) The asbestos felt as specified in Sect. 6-2.5 shall be of suitable width for smooth spiral application and shall be of approximately uniform width. The side lap of the felt shall be not less than one-sixteenth ($\frac{1}{16}$) of the width of the felt, and in no case shall be less than one-fourth ($\frac{1}{4}$) of an inch. The asbestos felt shall be applied neatly and smoothly and shall be free of wrinkles and buckles.

(d) Over the bonded asbestos felt wrapper shall be applied a spiral

wrapping of kraft paper as specified in Sect. 6-2.6 or an application of whitewash as specified in Sect. 6-2.7.

(e) For application to specials and other shapes see Sect. 6-3.11 of this specification.

Sect. 6-3.10—Application of Coal-Tar Enamel at End of Pipe Sections

(a) When pipe sections are to be joined together by field welding, the protective materials shall be left off the inside and outside surfaces at the ends a distance sufficient to permit the making of field joints without injury to the lining and coating.

(b) When pipe sections are to be joined together with mechanical couplings, the protective materials shall be left off the exterior of the pipe a distance back from the ends of one (1) inch more than one-half ($\frac{1}{2}$) the overall length of the assembled coupling. The interior enamel lining shall extend to the pipe end.

(c) For joints other than specified herein the length of pipe to be left bare at ends shall be in accordance with instructions supplied by the engineer.

Sect. 6-3.11—Specials—Cleaning, Lining and Coating

The resultant cleaning, lining, and coating and wrapping of specials shall be equivalent to the results of similar work on straight pipe sections. Methods deviating from the prescribed procedure shall be approved by the engineer. If the shape precludes spinning, the lining and exterior enamel, bonded asbestos felt and kraft paper or whitewash, shall be applied by hand.

(a) All surfaces shall be double coated by applying the enamel with hand daubers. The final brush strokes of interior enamel shall be made in the direction of flow and at right angles to the first coat. All brush strokes shall overlap and form a continuous coating or, as an alternate, the daubing may be done by the double lap or "shingling" method. This work shall be done in a workmanlike manner and no indiscriminate smearing of the enamel will be permitted. On all welds the strokes of the first coat of enamel shall be applied along the weld.

(b) Enameling buckets shall be filled from the heating kettles with ladles or from spigots attached to the kettles and shall not be dipped for filling. Buckets shall be kept clean and free of dirt at all times and shall not be set directly upon the ground or on enameled surfaces but shall be set upon suitable pads or blocks. Buckets shall not be allowed to accumulate excess chilled enamel but shall be kept clean.

(c) Where possible, hand enameling (daubing) shall be done from electrically heated or insulated buckets which shall be built and designed and of such capacity best adapted for the work so that they may be easily handled (preferably $2\frac{1}{2}$ gallon capacity). Enamel shall not be used from the enameling buckets below the minimum temperature specified by the manufacturer.

(d) Where overhead hand enameling is necessary inside of pipe or specials, the invert and sides of the pipe shall be protected from drippings and splashings of hot enamel by tarpaulins or heavy tar paper laid in the pipe.

(e) Hand enameling daubers shall be of the size best adapted for the work and shall be subject to the approval of the engineer. Daubers shall be made of the best grade of Tampico Fiber set in solid hardwood handles. Mops, sweeps, or knot daubers shall not be used. Long hand horseshoe daubers will be acceptable for large areas and flat work.

Sect. 6-3.12—Fittings

All fittings such as manholes, service connections, air valve connection and blowoff connections shall be externally protected with coal-tar primer and coal-tar enamel and the same application procedure shall be employed as specified under Sect. 6-3.1 of this specification.

Sect. 6-3.13—Electrical Inspection

(a) The contractor shall conduct electrical inspection of all coating by means of an approved electrical flaw detector, delivering a maximum of 10,000 volts at low amperage during the progress of coating application and shall repair all defective coating found.

(b) Before final acceptance of coal-tar enamel coating, the entire interior and exterior surfaces of all coated pipe may be inspected by the engineer and tested for defects by means of an electrical flaw detector and all defects found shall be satisfactorily repaired by and at the expense of the contractor.

FIELD PROCEDURE AND ENAMELING—SECT. 6-4

Sect. 6-4.1—Transportation and Handling Enameled and Wrapped Pipe

(a) Protected pipe at all times shall be handled with equipment such as stout wide canvas slings and wide padded skids designed to prevent damage to the coating. Bare cables, chains, hooks, metal

bars, or narrow skids shall not be permitted to come in contact with the coating. All handling and hauling equipment shall be approved by the engineer before use.

(b) When coated and lined pipe are shipped in railway cars, they shall be loaded and tied into a unit-load in strict accordance with current loading rules of the American Railway Association applicable to this type of pipe. All surfaces and loading stakes shall be properly padded with approved padding materials.

(c) In truck shipments, the pipe shall be supported on wide cradles of suitably padded timbers. All chains, cables, or other equipment used for fastening the load must be carefully padded.

(d) The purchaser shall inspect the pipe protection during the removal of the pipe from the original carrier at destination, and if the pipe protection is found damaged, the necessary repairs shall be made as directed by and at the expense of the pipe vendor.

Sect. 6-4.2—Handling Enameled and Wrapped Pipe in the Field or at Trench

(a) Pipe shall be stored along the trenchside, supported on 4 x 4 in. wooden timbers placed under the uncoated ends of the pipe.

(b) Pipe shall be hoisted from the trenchside to the trench by means of a wide canvas or leather sling. Chains, cables, tongs, or other equipment likely to cause damage to the enamel coating, or dragging or skidding the pipe, will not be permitted. The contractor shall allow inspection of the coating on the under side of the pipe while suspended from the sling. Any damage shall be repaired before lowering the pipe into the trench.

(c) Where the trench traverses rocky ground or ground containing hard objects that penetrate the protective coating, a layer of screened earth or sand not less than three (3) inches in thickness shall be placed in the bottom of the trench prior to installation of pipe.

(d) At all times during erection of the pipe line the contractor shall use every precaution to prevent damage to protective coating on the pipe. No metal tools or heavy objects shall be unnecessarily permitted to come in contact with the finished coating. Workmen will be permitted to walk upon the coating only when necessary and in case of such necessity the workmen shall wear shoes with rubber or composition soles and heels. In large diameter pipe subject to considerable traffic, heavy tar paper shall be laid and maintained in the bottom of the pipe through its entire length as long as there is need of passage through the pipe. This shall apply to all surfaces whether bare, primed, or enameled. Any damage to the protective

coating from any cause during the installation of the pipe line and before final acceptance by the purchaser shall be repaired as directed by the engineer by and at the expense of the laying contractor.

Sect. 6-4.3—Welded Field Joints—Coal-Tar Enamel Lining and Coating and Asbestos Wrapper

(a) The coal-tar primer and coal-tar enamel and asbestos wrapper used shall be the same material as used for coating and lining pipe.

(b) *Interior:* Before field pressure testing, interior welds of field joints shall be cleaned. Primer shall then be applied and allowed to dry according to the coating manufacturer's instructions. Hot enamel shall next be applied with daubers to specified thickness and shall overlap the main body of coating on each side of the weld to form a continuous coating free from defects.

(c) *Exterior:* After field pressure tests have been completed, joints shall be cleaned and primed. When the primer is dry, the field joints shall be manually coated and wrapped to the specified thickness. Enamel and asbestos felt shall overlap the coating on each side of the field joint to form a continuous external coating free from defects.

(d) All hand enameling shall be done in accordance with the procedure outlined in paragraphs under Sect. 6-3.11 of this specification and heating of enamel for field application shall be done in accordance with the procedure outlined in paragraphs under Sect. 6-3.5 of this specification.

(e) All field coating work shall be thoroughly inspected by the engineer, using an electrical flaw detector, and any flaws or holidays found shall be repaired by the contractor.

Sect. 6-4.4—Mechanical Couplings—Cleaning, Priming and Coating

All couplings shall be cleaned and primed as specified for the pipe at point of manufacture. The couplings shall be assembled only on pipe ends after any primer that has been applied is thoroughly dry. After installation, the primer coat shall be carefully touched up or reprimed, if necessary, and the exposed portion of the pipe and the coupling shall be coated with a coupler compound or coating recommended by the manufacturer of the coating used on the pipe. This coupler compound or coating shall be applied by pouring into approved coating catch pans designed for the size couplings involved. The compound or coating shall be capable of conforming to the normal movement of the buried pipe, without cracking.

Sect. 6-4.5—Backfilling

Backfilling shall be conducted at all times in a manner to prevent damage and abrasion to exterior protection on pipe.

(a) Placing of backfill about exterior protected pipe shall be done only in the presence of the Inspector after his final inspection and acceptance of exterior protection on the pipe.

(b) Immediately after placing and aligning pipe in the trench, loose backfill shall be placed about the pipe to a depth of one (1) foot above the pipe. This backfill shall consist only of fine soil or sand.

(c) In the event rocks or other hard objects occur in the backfill along any section of the pipe line, such backfill shall be screened before being placed about the pipe or, at the option of the contractor, suitable waste backfill from other parts of the line may be transported to and placed about the pipe in such sections.

(d) Settlement of backfill in the trench shall be by means of flooding and puddling. Tamping, jetting, or rodding with metal rods will not be permitted.

APPLICATION OF PAINT TO EXPOSED EXTERIOR STEEL SURFACES ERECTED ABOVE GROUND—SECT. 6-5

Sect. 6-5.1—General

Contractor shall furnish all labor, equipment, and materials required and shall prepare and paint all exposed steel surfaces erected above ground. The outside of all pipe above ground exposed to the weather shall receive two (2) coats of red lead primer and one (1) coat of aluminum paint. Each coat of paint shall be applied at the coverage rate of 500 square feet per gallon.

Sect. 6-5.2—Preparation of Exterior Surfaces of Pipe

Preparation of exterior surfaces shall comply in all respects with the procedure outlined in paragraphs under Sect. 6-3.2 of this specification. After completion of field welded joints, they shall be blasted to bright metal before field application of red lead primer.

Sect. 6-5.3—Priming of Exterior Surfaces of Pipe

(a) Red lead primer to be used shall be as specified in paragraphs under Sect. 6-2.8 of this specification. Application of red lead primer shall be as specified for coal-tar priming set forth in Sect. 6-3.3 (a) to (d) inclusive, of this specification, and shall be applied at the same time the interior of pipe is primed with coal-tar primer.

(b) Care shall be taken to prevent unnecessary abrasion or scarring of the primed surface before the paint film has dried hard and firm. Any damage to red lead primer shall be repaired before subsequent primer coats are applied. Red lead primer shall be allowed at least twenty-four (24) hours drying time before second coat of red lead primer or white enamel is applied.

Sect. 6-5.4—Second Coating of Exterior Surfaces of Pipe

Material and application for the second coat of red lead primer or white enamel shall comply in all respects to this specification.

Sect. 6-5.5—Finish Coat of Aluminum Paint on Exterior Steel Surfaces

(a) Finish coat shall be aluminum paint applied in the field by air spray gun in one (1) or two (2) coats as specified by the purchaser.

(b) Aluminum paint shall be composed of aluminum vehicle and aluminum bronzing pigment in accordance with this specification. Aluminum paint shall be mixed in the field as required for the work in ratio of two (2) pounds of pigment to one (1) gallon of vehicle. No additional thinner shall be used in the paint.

(c) Before application of finish coat of aluminum paint, the field joints shall be cleaned of all dirt and rust and primed and recoated with the same material in the same manner as prescribed for shop priming of the pipe.

APPENDIX

GENERAL—SECT. A6-1

Sect. A6-1.1—Scope

The foregoing specification covers the material and application requirements necessary to obtain adequate corrosion protection for steel pipe for ordinary service conditions found in water transmission and distribution systems.

This appendix, which covers specifications and application requirements for additional exterior protection to the pipe for the extraordinary or more severe conditions, is not a part of the specification unless specifically included by the purchaser as provided for in Sect. 6-1.3 of the specification.

Sect. A6-1.2—Sand Shield

(a) This type of exterior protection shall be used only when the methods of backfill as required in Sect. 6-4.5 of the specification are not available or considered undesirable.

(b) The pipe shall be lined inside and coated outside with coal-tar enamel and bonded asbestos felt wrapper, and kraft paper or whitewash, in accordance with all provisions of the specification. In addition, the entire pipe line, or such portions of the line as designated by the purchaser, shall be completely surrounded by screened sand before any backfill is placed in the trench. A minimum depth of three (3) inches of sand shall be placed in the trench before the pipe is laid and the sand placed about the pipe and to a minimum cover of twelve (12) inches over the pipe. Sand shall pass 100 per cent through a one-fourth ($\frac{1}{4}$) inch mesh screen.

Sect. A6-1.3—Coal-Tar Enamel and Bonded Double Asbestos Felt Wrappers, Enamel Coated

(a) This type of exterior protection shall be used only where extraordinary soil conditions exist, or on submarine lines, river crossings, etc.

(b) The coal-tar primer, coal-tar enamel, asbestos felt and kraft paper (or whitewash) shall be as specified for these materials in the main specification.

(c) The methods of application of these materials shall be the same as those prescribed in the specification.

(d) The resultant construction of this exterior protection shall be:

1. Coal-tar primer
2. Coal-tar enamel ($\frac{3}{32}$ inch, plus or minus $\frac{1}{32}$ inch thick)
3. Bonded asbestos felt
4. Coal-tar enamel ($\frac{1}{32}$ inch minimum)
5. Bonded asbestos felt
6. Coal-tar enamel ($\frac{1}{32}$ inch minimum)
7. Kraft paper (or whitewash)

Tentative Standard

American Water Works Association

SPECIFICATION

for

CEMENT-MORTAR PROTECTIVE COATING FOR STEEL WATER PIPE OF SIZES 30 INCHES AND OVER

Prepared by

Water Works Practice Subcommittee 7A

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These tentative specifications are part of a series of reports by A. W. W. A. Subcommittee 7A. They are as yet in tentative form and are printed for the purpose of bringing them to the attention of the membership of the Association.

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These are not official specifications of the A. W. W. A.; must not be referred to as such; and no authority is given or implied which would permit their use as official documents.—HARRY E. JORDAN, *Secretary, A. W. W. A.*

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Tentative Standard

SPECIFICATION FOR CEMENT-MORTAR PROTECTIVE COATING FOR STEEL WATER PIPE

OF SIZES 30 INCHES AND OVER

GENERAL—SECT. 7-1

Sect. 7-1.1—Scope

(a) This specification covers the material and application requirements to obtain corrosion protection for steel water pipe for the conveyance of water by the use of portland cement mortar applied by spinning or by centrifugal machine and by guniting.

(b) Corrosion protection shall be provided as follows:

1. *The inside of all pipe* shall receive a coat of cement-mortar lining applied by spinning and guniting or by centrifugal machine.

2. *The outside of all pipe* shall receive a coat of steel reinforced cement mortar applied by guniting.

Sect. 7-1.2—Supplementary Details to be Supplied by the Purchaser

When purchasing protection for steel water pipe it will be necessary for the purchaser to make supplementary specific statements in his specification as to the following:

(a) *Project:* Diameter, length, and location of pipe line including maps and drawings necessary to show all details of pipe within the scope of the contract.

(b) *Interior Protection:* Method of lining.

(c) *Exterior Protection:* Length of line to be (1) gunited; and/or (2) coated with other type of protection before guniting.

Sect. 7-1.3—Definitions

Under this specification the following definitions will apply:

(a) *Purchaser:* The word "Purchaser" shall mean either person, firm, corporation, or governmental sub-division entering into a con-

tract or agreement for the purchase of any materials and/or any work to be performed under this specification.

(b) *Contractor:* The word "Contractor" shall mean the person, firm, or corporation executing the contract or agreement with the purchaser to furnish any material and/or to perform any work under this specification.

(c) *Engineer:* The word "Engineer" shall mean the engineer or inspector employed by the purchaser and acting as his representative; or their respective assistants properly authorized and limited to the particular duties entrusted to them; or the purchaser, himself, acting as his own engineer.

(d) *Blasting:* The word "Blasting" shall mean blasting with standard sand blast sand or steel grit (approximately size #60) to clean and thoroughly remove all rust and mill scale from the steel.

(e) *Spinning:* The word "Spinning" shall indicate the process of applying cement mortar to the inside surface of pipe whereby the mortar introduced into the pipe is spread on the surface of the pipe and compacted thereon by the centrifugal force developed by spinning the pipe about its longitudinal axis until the mortar has consolidated and set sufficiently to allow removal of the pipe from the rolls.

(f) *Centrifugal Machine:* The words "Centrifugal Machine" shall mean the device for applying cement mortar continuously to the inside of the pipe after it has been installed, coated on the outside, joined, tested, and backfilled.

Sect. 7-1.4—Inspection and Testing

(a) The entire procedure of applying the protective coating material as herein specified will be rigidly inspected from the time the bare pipe is received until the pipe is coated, laid in the ground, tested, and backfilled. Such inspection shall not relieve the contractor of his responsibility to furnish material and perform work in accordance with this specification.

(b) All coating work to be acceptable must be applied in the presence of the inspector and all such work done in his absence will be subject to rejection unless the continuance of the work during his absence is specifically provided for by the inspector. If at any time it is found that the procedure of applying the protective coating material is not in accordance with this specification, all such coating work will be subject to rejection.

(c) Prior to approval of contractor's material, samples of material submitted by the contractor will be tested by the purchaser and if any sample is found not to conform to this specification, material represented by such sample will be rejected.

Sect. 7-1.5—Access for Inspector

The inspector shall have free access to those parts of all plants that are concerned with the furnishing of materials or the performance of work under this specification.

Sect. 7-1.6—Facilities for Inspector

The contractor shall furnish the inspector reasonable facilities and space without charge for the inspection, testing, and obtaining of such information as he desires respecting the character of material used and the progress and manner of the work.

Sect. 7-1.7—Material and Workmanship

All material furnished by the contractor must be of the specified quality. All work shall be done in a thorough workmanlike manner by mechanics under the supervision of experienced men skilled in the application of cement-mortar protection.

Sect. 7-1.8—Equipment

Contractor's equipment for cleaning, applying cement mortar, curing, and transporting shall be designed and manufactured and in such condition to permit the workmen to follow the procedure and obtain results prescribed in this specification.

MATERIAL SPECIFICATIONS—SECT. 7-2

Sect. 7-2.1—Portland Cement

Portland cement shall conform to the standard specification, A.S.T.M. Designation: C 9 – 37 as adopted by the American Society for Testing Materials, and to all subsequent amendments thereto, except for fineness which shall be as follows:

The cement shall be entirely free of lumps and the residue on a standard No. 200 sieve shall not exceed ten (10) per cent by weight.

Sect. 7-2.2—Sand

(a) Sand for spun mortar and/or gunite linings and coatings shall consist of natural sand from pits approved by the engineer and shall be washed, if necessary, to meet this specification. The control of washing of aggregate shall be such that the finer particles of sand are retained or removed as required. Washed or saturated sand shall be allowed to drain at least twenty-four (24) hours to a uniform moisture content before batching. Dry sand shall be moistened before handling, when necessary, to prevent segregation.

(b) Sand shall be composed of clean, hard, strong, durable, uncoated grains, free from shale, lumps, soft or flaky particles, injurious amounts of dust, alkali, organic matter, loam, or other deleterious substances. When tested in accordance with the Standard Method of Test for Organic Impurities in Sands for Concrete (A.S.T.M. Designation: C 40 – 33) of the American Society for Testing Materials, it shall show a color not darker than the standard color and not more than a total of five (5) per cent, by volume, of clay, silt, mica, or other objectionable inorganic materials as determined by settlement after shaking well with two and one-half ($2\frac{1}{2}$) times its volume of three (3) per cent, by weight, solution of sodium hydroxide in a graduated column.

(c) Sand as prepared for use shall be of such quality that 2 x 4 inch mortar cylinders, made with a mixture of cement and the sand under test, shall develop compressive strengths at seven (7) and twenty-eight (28) days of not less than 100 per cent of those developed by a mortar prepared in the same manner with the same cement and graded Ottawa testing sand, all in accordance with the Standard Method of Test for Structural Strength of Fine Aggregate Using Constant Water-Cement Ratio Mortar (A.S.T.M. Designation: C 87 – 36) of the American Society for Testing Materials.

(d) The grading of the sand, as determined in accordance with the Standard Method of Test for Sieve Analysis of Aggregates for Concrete (A.S.T.M. Designation: C 41 – 36) of the American Society for Testing Materials, shall be within the following limits:

1. *Sand for Mortar Lining by Spinning:*

Passing #4 Square Sieve	100 per cent
Passing #4 Square Sieve and retained on #8	5 to 10 per cent
Passing #8 Square Sieve and retained on #16 not more than	28 per cent
Passing #16 Square Sieve and retained on #30 not more than	28 per cent
Passing #30 Square Sieve and retained on #50 not more than	28 per cent
Passing #50 Square Sieve and retained on #100 not more than	13 to 18 per cent
Passing #100 Square Sieve	4 to 7 per cent

2. *Sand for Gunite Coating:*

Sieve Sizes	Minimum Per cent	Maximum Per cent
Passing $\frac{1}{2}$" Square Sieve		100
" $\frac{3}{8}$" " " and retained on #4	5	15
" #4 " " " " " #16	20	40
" #16 " " " " " #50	30	50
" #50 " "	15	25

Sect. 7-2.3—Wire Mesh

Wire mesh for reinforcement of exterior gunite shall be electrically welded wire fabric or woven wire fabric and specially crimped or otherwise self-furring to hold the reinforcement $\frac{3}{8}$ to $\frac{1}{2}$ of an inch away from the surface on which it is applied. The wire mesh shall weigh not less than twenty-seven (27) pounds per 100 square feet and the cross-section of metal extending lengthwise of the strip shall be approximately twice the cross-section of the transverse members of the mesh. The reinforcement may or may not be galvanized, at the contractor's option, but in any case it shall be free from paint, other coating material, loose mill scale, dirt or excessive rust.

Sect. 7-2.4—Sealing Compound

(a) Sealing compound for exterior gunite shall be composed of coal-tar pitches and coal-tar solvents suitably blended to produce a liquid coating which can be sprayed or brushed to the wetted surface of the gunite shield.

	Minimum	Maximum
Viscosity—Saybolt Furol, 60 cc. at 60 F. (seconds) A.S.T.M. D 88 - 38	200	250
Water Content A.S.T.M. D 95 - 30	———	0.2 per cent
Specific Gravity at 77° F. A.S.T.M. D 287 - 36	1.10	1.16
Insoluble in CS_2 A.S.T.M. D 4 - 27	———	15 per cent
Distillation by Weight A.S.T.M. D 20 - 30		
To 200° C.	12 per cent	———
To 235° C.	20 per cent	———
To 300° C.	———	40 per cent
Softening point of residue A.S.T.M. D 36 - 26	120° F.	150° F.
Flash point A.S.T.M. D 56 - 36	95° F.	———

(b) Sealing compound for curing gunite placed on interior joints shall consist of a suitable blend of highly refined asphalts with pigment held in suspension or solution in a volatile petroleum solvent. Not more than fifty (50) per cent, by weight, shall be volatile. The blended asphalts shall have a melting point of not less than 145°F. as determined by ring and ball method, A.S.T.M. Designation: D 36 - 26.

The sealing solution shall have the following characteristics: At ordinary atmospheric temperatures it shall be suitable for spraying on moist mortar surfaces and shall have the ability to retain sufficient moisture within the mortar mass to permit proper hydration of the cement.

The solution shall form a membrane which shall adhere to the moist mortar and which shall not disintegrate, check, peel, or crack from the surface, nor show signs of such deterioration within thirty (30) days after application under actual working and weather conditions.

The solution shall become dry to touch within two (2) to four (4) hours after application under ordinary conditions and shall not thereafter be tacky nor track off the mortar when walked upon.

The material shall be ready for use as shipped by the manufacturer. No diluting will be permitted.

SHOP APPLICATION OF CEMENT MORTAR LINING—SECT. 7-3

Sect. 7-3.1—General

The contractor shall furnish all labor, equipment, and material required, shall prepare all surfaces to be coated and shall prepare and apply portland cement-mortar lining to the interior and exterior surfaces of all pipe to be coated. Application of cement-mortar lining to the interior of straight sections shall be by spinning. Application of portland cement mortar to all exterior surfaces and to the interior surfaces of bends, specials, and other sections whose shapes preclude lining by spinning shall be by the gunite process

Sect. 7-3.2—Preparation of Surfaces

The interior surface of all pipe to be lined with portland cement mortar shall be thoroughly cleaned by sand or steel grit blasting.

(a) *Hand Cleaning:* Before blasting, all oil and grease on the surfaces of the metal shall be removed thoroughly by flushing and wiping, using "Xylol," or other suitable solvents, and clean rags. The use of dirty or oily rags or solvent will not be permitted. All other foreign matter shall be removed by buffing or by scraping and wire-brushing. After cleaning, the pipe shall be protected and maintained free of all oil, grease, and dirt that might fall upon the pipe from whatever source until the pipe has received its cement-mortar coating.

(b) *Mechanical Cleaning:* All metal surfaces shall be thoroughly blasted to bright metal in a manner satisfactory to the engineer. Blasted surfaces which acquire a heavy coat of rust before being coated with cement mortar shall be cleaned of all rust by buffing or wire-brushing or, at the discretion of the engineer, shall be reblasted. Adequate air separators shall be used to remove all oil and free moisture effectively from the air supply to the blaster. Any pipe showing

pits or structural defects shall be set aside pending examination by the engineer.

(c) Immediately upon completion of blasting, surfaces at the ends of pipe, which are to be left bare for field welding or other purposes, shall be given a brush coat of a suitable rust preventative material. Rust preventative coating shall be applied and shielded and maintained during the subsequent application and curing of the mortar lining and application of the exterior coating to protect the surfaces beneath from rusting, pitting, or other corrosion until the pipe sections are assembled in the field. Rust preventative material used shall be of such character that the quality of the weld at the joint, where used, will not be impaired by its presence.

Sect. 7-3.3—Mortar for Interior Lining

Mortar for the spun lining shall be a mixture of portland cement, screened sand, and water, well mixed and of the proper consistency to produce a dense homogeneous lining that will bond firmly to the pipe.

(a) Portland cement shall comply in all respects to the material specified in paragraph 7-2.1 of this specification.

(b) Sand shall comply in all respects with material specified in paragraph 7-2.2 (d) of this specification.

(c) Water to be used shall be clean and free from objectionable quantities of organic matter, alkali, salt, or other impurities which, in the opinion of the engineer, might reduce the strength, durability, or other qualities of the mortar.

(d) The mortar shall be mixed in the proportions of approximately one (1) part of portland cement to two and one-half ($2\frac{1}{2}$) parts of sand, by weight, the exact proportions of these ingredients and the amount of water entering into each batch to be determined from the materials used and the results obtained by trial applications. The mortar shall be mixed by machine for a period of not less than three (3) minutes continuously and after mixing shall be used promptly for lining the pipe. No mortar which has attained its initial set shall be used.

(e) The quantity of water entering into a batch of cement mortar shall be sufficient, with a normal mixing period, to produce a mortar which can be properly placed without segregation and compacted by the methods herein specified to give the desired density, impermeability to water, bond, and smoothness of surface.

(f) The amount of cement and aggregate entering into each batch of cement mortar shall be determined by direct weighing equipment

furnished by the contractor and approved by the engineer; provided, that where batches are proportioned to contain an integral number of sacks of cement, and the cement is delivered at the mixer in the original unbroken sacks, the weight of the cement contained in each such sack may be taken without weighing as ninety-four (94) pounds. Direct weighing equipment shall comply with the following requirements:

1. The accuracy of the weighing equipment shall conform to the requirements of the United States Bureau of Standards. Spring scales will not be permitted.

2. The equipment shall weigh each aggregate separately and each unit shall include an underweight and overweight indicator. The underweight indicator shall indicate the filling of the last 200 pounds of the batch. The overweight indicator shall indicate overweight to a maximum of fifty (50) pounds. Both indicators shall be graduated in a manner at least as legible as 5-pound units for cement and 10-pound units for aggregate, indicated by alternate black and white divisions approximately $\frac{1}{8}$ of an inch wide with other markings to emphasize 25, 50 and 100 pounds. At the contractor's option approved cumulative weighing equipment may be used instead of the individual weighing equipment herein specified. Cumulative weighing equipment, if used, shall be equipped with a visible dial or equally suitable device which will accurately indicate scale load at any stage of the weighing operation from zero to full load.

3. The equipment shall be arranged so that the operator may conveniently observe and inspect the operation of the bin gates and also the materials in each weighing hopper. The underweight and overweight indicators or weighing dials and the water-measuring device shall be in full view of the operator when he is at the controls.

4. The equipment shall be capable of ready adjustment for compensating for the varying weight of moisture contained in the aggregates or for changing and proportioning batch weights.

5. The equipment shall be operated to control the weight of the cement to within one (1) per cent of that specified and the weight of the aggregate to within two (2) per cent of the specified weight. Automatic weighing and batching equipment shall be used unless the use of manually-operated equipment in special cases is approved in writing by the engineer.

6. The equipment shall be arranged to permit the convenient removal of overweight material in excess of the prescribed tolerances.

7. The station from which the control of the weighing and mixing operation is directed shall be located in such a position that the oper-

ator may conveniently observe the concrete in the mixer during the mixing operation.

The contractor shall provide standardized metal weights for testing the accuracy of the weighing equipment and shall test the cement scales at least once daily and the other weighing equipment at least once weekly. All such tests shall be conducted in the presence of the engineer.

(g) The quantity of water entering the mixer shall be measured by a suitable water meter or other measuring device of a type approved by the engineer and capable of measuring the water in variable amounts within a tolerance of one (1) per cent. The meter mechanism shall be capable of being locked in position to deliver constantly any specified amount of water to each batch, and shall include a setback register with a readily visible vertical face and double hands reading in cubic feet and decimals thereof. A positive quick-acting valve shall be used for a cut-off in the water line to the mixer. The operating mechanism shall be such that leakage will not occur when the valves are closed.

Sect. 7-3.4—Application and Surface Finish

(a) Each section of pipe, while mortar is being placed therein and for a sufficient time thereafter, shall be revolved with its axis in a horizontal position and at such a speed to produce a uniform distribution of the mortar over the interior surface of the pipe section. Sufficient mortar shall be mixed in one batch to line completely one pipe section and the mortar shall be placed in the pipe within one (1) minute after discharge from the mixer in a manner providing immediate and uniform longitudinal distribution of the batch from end to end of the pipe section.

(b) After all the mortar has been placed in the pipe section and has become distributed to a uniform thickness over the interior pipe surface, the rotation of the pipe shall be increased to a speed which will compact the mortar but in no case less than a peripheral speed of 3,200 feet per minute, which speed shall be maintained for a sufficient length of time to secure the greatest possible density of mortar and smoothness of surface and sufficient compaction and bond to permit removal of the pipe from the spinning machine without injury to the lining.

(c) The pipe shall be suitably braced with external rings during the spinning operation. In the event any section of pipe, when rotated in the spinning machine at the peripheral speed to be used for compaction, vibrates or exhibits any other departure from the

smooth, concentric rotation necessary to produce a lining of the required quality, such section of pipe, before the batch of mortar is deposited, shall be trued to cylindrical shape so that the required smooth concentric rotation shall be obtained. As the points where the longitudinal seams in the pipe come in contact with wheel or belts of the spinning machine the outside bead of the weld may be reduced by chipping, but such chipping shall be done in a manner which will not impair the strength of the weld. External stiffening rings shall be removed not less than seventy-two (72) hours after application of lining.

(d) Provision shall be made to remove all water and laitance expelled during the spinning operation in such a manner that the interior surface shall be smooth, straight, and true. At the most suitable time after removal of the pipe from the spinning machine, as determined from results obtained, the lining shall be given a steel-troweled or smoothing bar finish by skilled operators and a second troweling may be required in the event the first troweling fails to remove all laitance and produce a smooth hard finished surface.

(e) The thickness of lining shall be $\frac{1}{2}$ of an inch with a tolerance of plus or minus $\frac{1}{8}$ of an inch.

(f) On weld joint pipe six (6) inches at each end of each section shall be left uncoated until the pipe has been erected and welded in the field. On all other types of pipe the length of pipe left bare at the ends shall be in accordance with instructions from the engineer. Ends of coating shall be left square and uniform. Feathered or uneven edges will not be permitted.

(g) To facilitate the proper placing and setting of the cement mortar in cold weather, warming of steel pipe, aggregate, and mixing water will be permitted. Temperature of warmed material shall not exceed 150 degrees Fahrenheit.

(h) Where openings in the pipe shell for thimbles or for other purposes are required, a sufficient quantity of the spun mortar lining to accommodate the welding of steel work at the opening shall be removed while in a sufficiently green condition to facilitate its separation from the steel plate surface. The required opening shall be cut in the steel plate and the steel work welded in place at any time after the concrete lining has cured at least seventy-two (72) hours. Such openings shall not be placed closer than three (3) feet from the end of the pipe section. At all times while the operations described herein are being performed on the pipe section and irrespective of necessary transportation to and temporary storage at the welding

shop, the spun mortar lining shall be maintained under continuous water spray curing conforming to the requirements of Sect. 7-3.6 of this specification. After completion of all welding necessary for attachment of steel work the contractor shall remove all damaged lining, prepare the interior surfaces, and place and restore the lining by guniting in accordance with Sect. 7-3.5 of this specification.

(i) The operations of preparing surfaces, applying, finishing, and curing the spun mortar lining, and the coordinating of said operations with pipe fabrication and application of exterior coatings will be affected by the types of equipment provided by the contractor, by weather conditions and by the degree of protection from the weather afforded by the contractor's plant. In order to adapt such operations to the conditions mentioned, the contractor shall cooperate with the engineer in making reasonable modifications in the manufacturing procedure whereby the results can be improved.

Sect. 7-3.5—Specials—Lining by Gunite

(a) The application of cement-mortar lining to angles, bends, specials, or other sections whose shapes preclude lining by the centrifugal casting process, shall be lined by the gunite method, except where any course more than eight (8) feet long is included in an angle or bend it shall be coated by the centrifugal casting process unless otherwise permitted by the engineer.

(b) Guniting for interior lining shall conform to the requirements for gunite as set forth in Sect. 7-5. of this specification except that the fine aggregate and the proportioning of the fine aggregates and portland cement shall conform to the requirements set forth in Sect. 7-3.3 of this specification. Reinforcing mesh will not be required for inside lining.

(c) Gunite shall be placed in the top and sides of the pipe, then screeded to a uniform thickness and the ground lines or blocks removed. All rebound and waste material shall then be removed by air blowing and gunite placed in the bottom of the pipe and screeded. The entire surface shall then receive a final flash coat of gunite and shall be steel-troweled to a true surface equal in smoothness to the spun lining in such a manner as not to impair the bond between mortar and pipe. The guniting and surface finishing shall be completed in one operation before any part of the mortar lining has set and shall be applied continuously without the use of construction joints.

(d) Material for the final flash coat of gunite shall be composed of one (1) part portland cement and two (2) parts sand. Sand shall

comply in all respects with that specified in Sect. 7-2.2 (d) 1 of this specification except that it shall pass 100 per cent through a $\frac{1}{8}$-inch mesh screen and not less than sixteen (16) per cent shall pass through a 50-mesh screen.

(e) Thickness of gunite lining and tolerance in thickness shall be the same as required for spun lining.

Sect. 7-3.6—Curing

(a) Immediately upon the completion of the lining of each section of pipe or special, the section shall be closed tightly at each end by bulkheads. After the mortar has set, but not later than twelve (12) hours after application of the lining, curing shall be commenced by the water spray method and thereafter continued for the required period of fourteen (14) days before laying.

(b) The water spray method of curing shall consist of sprinkling the cement-mortar lining with water by means of sprinkler heads placed within the pipe, spaced and of such capacity to keep the entire surface of the cement-mortar lining continuously wet throughout the entire period of curing and storing.

(c) The application of any exterior coating shall begin not less than seventy-two (72) hours after completion of inside lining but in any event such water spray curing shall be continued inside without interruption during the application of such exterior coatings and thereafter until the pipe is finally loaded for transportation to the trench regardless of the lapse of time after loading.

(d) Each pipe section shall be closed at the ends during transportation and storage along the trench and the contractor shall continue the interior water spraying and shall schedule his operations so that all pipe will be laid in the trench within twenty-four (24) hours after such water spray curing has been discontinued.

(e) After the pipe has been laid each section of pipe line between manholes shall be filled with water and in order to avoid unnecessary drying of the mortar lining the contractor shall conduct diligently and without delay the operations at field joints and other required work preparatory to filling the pipe with water.

Sect. 7-3.7—Protection of Lined Pipe

(a) The contractor shall protect all cement mortar from damage during handling, transportation, and erection of the pipe. After the inside mortar lining has been cured, internal bracing shall be placed at the uncoated ends of the pipe and elsewhere, if necessary, to prevent the pipe from exceeding $\frac{1}{2}$ of one (1) per cent out-of-

roundness measured on the pipe diameter, and all such bracing, except any that may interfere with joining the pipe together, shall remain in place until the pipe has been installed and backfilled.

(b) After erection of the pipe the contractor shall remove any damaged coating and replace it with new gunited lining conforming to the requirements of Sect. 7-3.5 of this specification.

(c) If, in the opinion of the engineer, conditions are such as to require the lined pipe be protected from the rays of the sun, the contractor may be required to coat the outside of the pipe with whitewash immediately after spinning and, when necessary for protecting the lining of pipe exposed to extreme solar heat, shall cool the pipe by covering it with wet burlap just prior to applying the whitewash.

(d) When removing the pipe from the spinning machine and in all subsequent handling during transportation and installation in the trench, each section of pipe shall be lifted gently by means of slings spaced to prevent bending or other deformation of the section.

FIELD APPLICATION OF CEMENT MORTAR LINING—SECT. 7-4

Sect. 7-4.1—General

The contractor shall furnish all labor, equipment and material required, shall prepare all surfaces to be coated and shall prepare and apply portland cement-mortar lining to the interior surfaces of all pipe to be lined. Application of cement-mortar lining to the interior of the entire line, including both curves and tangents, shall be by *centrifugal machine* in which the machine progresses uniformly through the pipe which has been previously laid, jointed, tested and backfilled.

Sect. 7-4.2—Preparation of Surfaces

The interior surface to be lined shall be cleaned immediately before the mortar is applied. Loose scale and rust and all accumulations of dirt or debris shall be removed and the surface treated as may be necessary to insure a successful application of a durable lining. Neither shot nor sand blasting is required after the fabrication of the pipe, nor is it necessary to barricade the ends of the pipe. Oil and grease shall be removed by an approved volatile solvent.

Sect. 7-4.3—Mortar for Interior Lining

In general the provisions of Sect. 7-3.3, of this specification, shall apply with the following modifications and additions: Mortar for

the *centrifugal machine* lining shall be of proper consistency to provide a dense, homogeneous lining which will hold firmly against the pipe surface.

(a) Sand shall be well graded, clean and free from organic matter. All sand, and if necessary cement, shall receive a careful secondary screening after receipt from pit or mill. The sand shall be thoroughly dried, preferably in a rotary kiln, before being passed through a 16-mesh screen.

(b) The proportions of cement and sand in the mortar for the lining shall be one part of portland cement to from one to one and one-half parts of screened sand by volume, the exact proportion to be determined by the characteristics of the sand available for the work. The mortar shall be mixed by machine for a sufficient length of time to obtain maximum plasticity, in general for at least five (5) minutes, and shall be used promptly for lining the pipe.

(c) The water-cement ratio shall be carefully controlled and kept to absolute minimum. Due allowance shall be made, as necessary, for moisture existing or collecting on the walls of the pipe.

Sect. 7-4.4—Application and Surface Finish

(a) After the pipe has been installed, joined, tested, backfilled, and cleaned, the lining shall be continuously applied by centrifugal machine. The machine shall apply the mortar by centrifugal action without the use of compressed air and follow its application by automatic troweling to a uniform thickness and smooth finished surface. The machine shall be continuously and uniformly self-propelled so that nothing shall come in contact with the troweled surface until it has attained its initial set.

(b) The cement-mortar lining shall nowhere be less than $\frac{3}{16}$ of an inch on the plate surface.

(c) In placing the lining, openings in the pipe line leading to air-valves, blowoffs, manholes and other appurtenances, and the ends of small pipes which transmit pressure or carry water from the steel pipe line shall be temporarily covered or plugged with wooden stoppers, which shall be removed later without damaging the cement mortar, or other suitable arrangements shall be provided, so that the cement mortar shall not be thrown into such openings. All entrance manholes will be made accessible by the Purchaser.

Sect. 7-4.5—Curing

Immediately upon the completion of the lining of a day's run of the machine or at convenient intervals, the pipe shall be closed at

both ends by bulkheads and manhole covers shall be kept in position to prevent the circulation of air. Water shall thereupon be carefully introduced into the closed section between bulkheads soon after initial set. Each completed section of the line shall have water introduced or it shall be sprinkled or sprayed from time to time so that the mortar lining will be kept moist until it is completely cured.

APPLICATION OF EXTERIOR GUNITE—SECT. 7-5

Sect. 7-5.1—General

For application of gunite the contractor shall employ only men who furnish satisfactory evidence of having had experience in such work and who are fully qualified to do the work properly and carry out the requirements of this specification.

Sect. 7-5.2—Material

Material for gunite shall be as specified in the following Sections:
(a) Sect. 7-2.1—Portland cement.
(b) Sect. 7-2.2 (d) 1—Sand.
(c) Sect. 7-2.3—Wire mesh.

Sect. 7-5.3—Application

(a) The wire reinforcing mesh shall be applied to the pipe so that the heavier or longitudinal members of the strip extend circumferentially around the outside of the pipe and shall be applied under sufficient initial tension to prevent the freshly applied gunite from sagging from the pipe. Ends of the reinforcing strips shall overlap one (1) full mesh and shall be tied securely at intervals not exceeding twelve (12) inches with No. 16 gage steel wire. Successive circumferential strips of mesh shall have a gap of two (2) inches between them and the longitudinal joint of each course of the mesh shall be staggered with the joints of adjacent courses.

(b) Before applying exterior gunite the pipe shall be adequately braced on the interior with timbers or otherwise as provided in Sect. 7-3.7 (a) of this specification. Where braces are placed on coated areas inside the pipe sufficient bearing surface shall be provided at the ends of the braces so that no damage will be done to the mortar lining.

(c) Gunite shall be mixed in proportions of one (1) sack of cement (94 pounds) to four and one-half ($4\frac{1}{2}$) cubic feet of sand unless otherwise directed by the engineer. The sand and cement shall be thoroughly mixed in a relatively dry state before being deposited in

the placing machine. Machine mixing will be required unless specific authority to use hand mixing is given by the engineer. The machine and its operation will be subject to the approval of the engineer. The mixing operation shall continue for a period of not less than one (1) minute after all sand and cement are placed in the mixer. The sand shall contain, or be moistened with, five (5) per cent to ten (10) per cent of water, by volume, and shall not be mixed with the cement until just before placing in the hopper in order to insure against partial setting of the cement. Dry mixed material shall be used promptly after mixing. Any material that remains in the hopper longer than forty-five (45) minutes after mixing shall be discarded.

(d) Gunite shall be placed with the machine operating at an air pressure of not less than thirty-five (35) pounds nor more than forty (40) pounds per square inch at the gun when 200 feet or less of material hose is used. These pressures shall be increased five (5) pounds for each additional fifty (50) feet of hose and not more than 400 feet of hose shall be used with any machine. The water pressure at the nozzle shall be at least fifteen (15) pounds greater than the air pressure in the machine and the nozzle used shall be of the type which will secure proper hydration of the mix.

(e) The gunite shall be thoroughly and uniformly hydrated without the use of excess water and shall be shot with the nozzle approximately normal to the surface being covered. Every precaution shall be taken to prevent the occurrence of sand pockets and if any develop they shall be uniformly cut out and replaced with satisfactory machine placed material. No hand patching will be allowed. The contractor shall apply the coating in such a manner that no sloughing shall occur at any time during or following its application.

(f) Gunite shall have a minimum thickness of $\frac{3}{4}$ of an inch and shall at all places cover the reinforcement.

(g) If for any reason it is necessary to interrupt placing the gunite for a length of time that will result in the material taking a permanent set, a square shoulder shall be formed at the ends of pipe sections and/or elsewhere by shooting against a backing-up strip or by cutting back with a trowel or other suitable tool the irregular edges of the material last placed to a clean unbroken surface perpendicular to the face that will provide a suitable connection or construction joint between such material and the material to be subsequently placed. When performing this work care shall be taken not to shatter or disturb the material remaining in place nor disturb the imbedded wire mesh. Before placing fresh material against the surfaces of

such joints, surfaces shall be carefully cleaned and wetted to insure a good bond between the fresh material and that previously placed.

(h) Gunite shall be cured by the sealing compound method. When gunite has hardened sufficiently to permit sprinkling it shall be thoroughly wetted by sprinkling and maintained in a moist condition until application of sealing compound. Sealing compound shall comply with the material specified in Sect. 7-2.4 (a) of this specification and shall be applied not less than fourteen (14) hours after application of gunite. Sealing compound may be applied by the brush or spray gun method at a rate of coverage not to exceed 250 square feet per gallon on troweled surfaces and ninety (90) square feet per gallon on rough untroweled surfaces. When the first coat is dry a second coat shall be applied in the same manner and quantity as the first. When the sealing compound is dry the pipe shall be given a coat of waterproof whitewash.

Sect. 7-5.4—Application of Gunite over Other Coatings

Where gunite is to be applied over a coal-tar enamel or other type of protective coating, the foregoing procedure for gunite shall apply with the following exceptions:

(a) Prior to attachment of reinforcing mesh a first coat of gunite approximately $\frac{1}{4}$ of an inch thick shall be applied over the coating and allowed to set not less than two (2) hours immediately after which it shall be continuously water cured by means of an adequate method of sprinkling during the entire period prior to application of the succeeding layer of gunite.

(b) The mesh shall be stopped approximately five (5) inches back from the edges of the protective coating and the gunite coating shall be applied to cover the mesh completely.

FIELD APPLICATION AND PROCEDURE—SECT. 7-6

Sect. 7-6.1—Field Joints

(a) After completion of the welding of field joints or other method of installation and prior to placement of cement-mortar lining on uncoated areas, all such joints shall be hydrostatically or otherwise tested for tightness. Such uncoated areas shall be thoroughly cleaned of all corrosion and substances adhering to the steel plate surfaces including any residue from the protective coating previously applied. Steel surfaces shall then be coated with cement mortar by the gunite method in accordance with the requirements of Sect. 7-3.5 for interior guniting and Sect. 7-5 for exterior guniting.

(b) Before placing fresh gunite against the square ends of existing cement-mortar coating at the joints, the surfaces of such ends shall be carefully cleaned and wetted to insure a good bond between the fresh material and that previously placed.

(c) Gunite shall be cured by the sealing compound method as specified in Sect. 7-5.3 (h), except that the material used for inside joints shall be as specified in Sect. 7-2.4 (b).

Sect. 7-6.2—Backfilling

(a) The pipe line shall be filled with water prior to backfilling and flooding of trench. In order to facilitate filling the pipe with water under pressure, steel plate bumped heads adequate for the specified pressure shall be furnished and installed in the pipe by the contractor at intervals not greater than at each manhole. Each bumped head shall be provided with suitable fittings and valves for venting of trapped air and filling with water and draining the intervening sections of pipe line. Bumped heads may be installed in the shop but in any event shall be installed as soon as practicable after each stretch of pipe line has been laid; and in order that the filling of each section with water shall not be delayed unnecessarily, the contractor shall perform diligently the work of making and finishing the required field joints inside the pipe.

(b) Immediately after the field joints in the pipe, lining, and all other required work inside each section of steel pipe line between bulkheads have been completed, the section of pipe line shall be filled with water and the water pressure shall be increased to not less than fifty (50) pounds per square inch and maintained at such minimum pressure until backfilling of pipe line is completed.

(c) Before acceptance of the contract work all bulkheads shall be removed, except as may otherwise be ordered, and at each location where a bulkhead is removed the pipe shall be completely restored to a condition conforming to the requirements of this specification.